the OIL AND GAS JOURNAL

PUBLISHED WEEKLY SEPTEMBER 18, 1961

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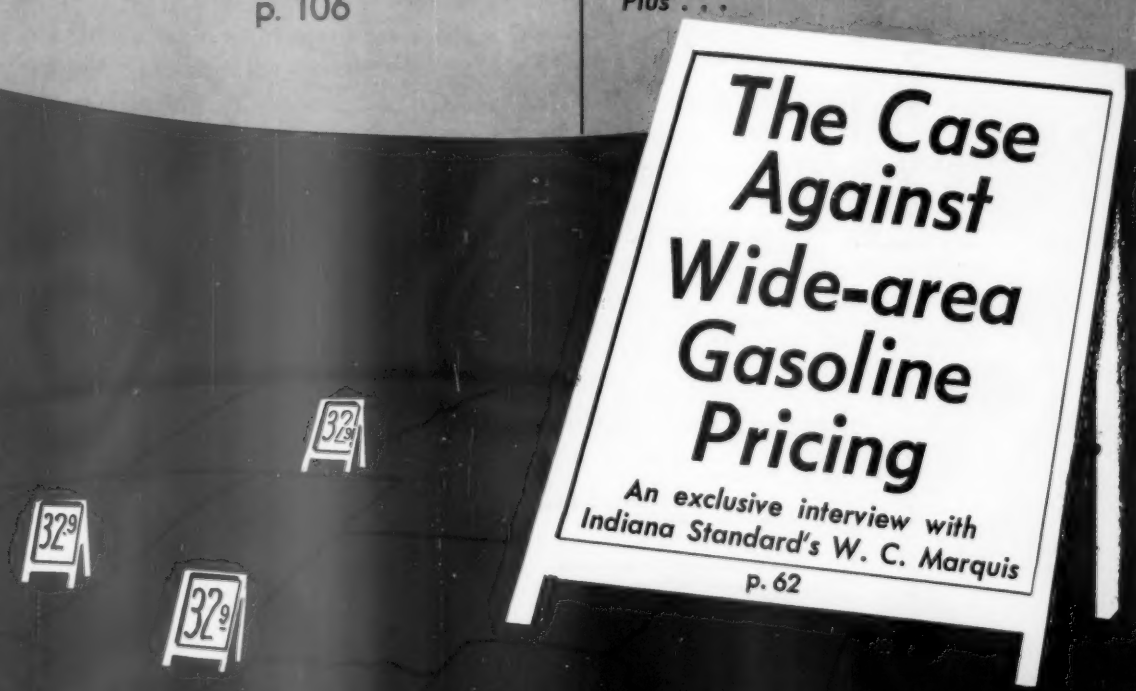

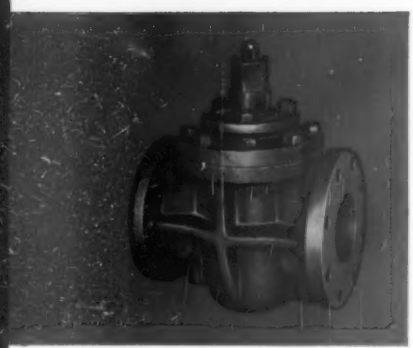

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The Oil and Gas Journal is published weekly by The Petroleum Publishing Co., 211 S. Cheyenne, Tulsa 3, Okla. Second-Class postage paid at Tulsa, Okla. Copyright 1961 by The Petroleum Publishing Co. United States and foreign rates to the petroleum industry, 1 year $6, 2 years $9, 3 years $12.

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Drilling-Production

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Kuwait Caravans Move on Tracks 111
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Trailer Rig Completes a Well a Day 114
By James E. Armstrong
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By John P. O'Donnell
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Refining-Processing

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THE OIL AND GAS JOURNAL **Newsletter**

September 18, 1961

Significant this week

Oil-industry facilities on the Gulf Coast caught a savage punch from Hurricane Carla, but damage generally was less than expected.

Twenty-one refineries shut down for 3 or 4 days, with estimated loss in runs of 10 million barrels. Tanker movements were disrupted. But no oil personnel were killed or hurt.

Greatest plant damage was suffered by Dow Chemical at Freeport, Tex., where 14 ft. of sea water flooded the plant.

Advance warning and preparation saved lives and kept property damage to a minimum (p. 57).

Heating-oil season could be a pretty good one, if management calls its shots right and if cold weather comes early.

Good management probably will be the key.

Demand is promising, but runs are still too high and stocks are out of kilter.

Industry really needs a good season to make up for miserable gasoline performance this summer (p. 66).

Indications are that wide-area gasoline pricing plans installed by several marketers are not working out.

That's the word from American Oil's W. C. Marquis. The price wars that the plans seek to prevent are just as frequent and violent as ever. And under the strain of these wars, many parts of the plans have been abandoned.

Marquis gives a rundown on the situation in an exclusive Journal interview (p. 62).

Texaco has made world's first septuple completion.

Well at Blessing, Tex., near Houston, produces from two oil horizons and five separate gas strata at same time. Depths range from 7,020 to 8,553 ft. (p. 80).

This fall Texaco will make some more news by kicking off injection in massive Aneth field water flood.

Utah flood may become world's largest, as far as acreage is concerned. Two projects have been approved and two others are being negotiated. When all are operating, flood will cover 64,500 acres (p. 74).

East Texas basin operators know it won't be easy to get another James reef strike as glamorous as Fairway.

But they have this comfort: Throughout oil history, there is no instance of a big oil-producing reef pool which didn't have rich companion pools.

In Fairway's case, the question is which way to go.

Second article in a Journal series about Fairway examines this problem and explains how it may be attacked (p. 68).

Oil-injection blast furnace at Hamilton, Ontario is stirring keen interest among steel men of free world.

Dominion Foundries & Steel, Ltd., may have blast furnace of the future in this show piece. Unit marks first commercial use of oil as a supplementary fuel and source of reducing gas in preliminary steel making.

Esso Research, which developed oil-injection process, thinks major new oil-and-gas market may be in offing (p. 72).

Elsewhere around the world:

It's up to the British Government to say whether nation will take big imports of Saharan liquefied natural gas.

House of Commons committee has okayed commercial tanker shipments of liquefied methane. It urges quick approval by government, but political angles are involved in decision.

Coal industry is fighting imports. And Britain must weigh inherent threat to an energy-supply source from politically unstable Algeria (p. 81).

Trenching and pipe laying were combined in first pipeline crossing of Venezuela's mighty Orinoco River.

Tellepsen trencher straddled pipe after it was laid on river bottom. Barge pulled trencher back and forth; revolving cutters deepened trench on each pass.

The 5,200-ft. crossing is part of 45-mile 24-in. line that links Phillips Petroleum's Morichal field in upper Venezuela with company terminal on Orinoco (p. 93).

Kuwait Oil has licked problem of moving drilling rigs to new desert locations quickly and cheaply.

Derricks and other equipment ride on crawler-track carriages. Tractors pull the caravans across Kuwait's ancient sands (p. 111).

News in the making

Another huge water flood is shaping up in West Texas.

Target is Slaughter field. Eleven majors and independents are interested in forming 18,000-acre unit. Involved in plans: Large block of Mallet Land & Cattle lease and other leases in southwestern Hockley and southeastern Cochran counties. Unit would take in more than 500 wells.

Proposed unit area has produced about 61 million barrels, with possibly another 15 million barrels of primary oil available. Water flooding would boost total ultimate recovery by additional 115 million barrels.

Washington checklist:

Office of Civil and Defense Mobilization will be known as Office of Emergency Planning from now on.

Change takes effect as soon as President Kennedy signs bill already passed by Congress. Part of old OCDM's functions are being shifted to Defense Department, but oil-related matters will be handled by new OEP.

Among other things, OEP will take part in plan being formed to let military obtain world-wide oil data from the industry.

Next development in fuels study will deal with personnel.

Now that Senate has passed resolution for the study, these steps must be taken: Selection of special committee from members of Interior Committee, appointment of three ex-officio members, and completion of a staff—including someone familiar with oil.

Meanwhile, House subcommittee making another fuel study hopes to start public hearings in Washington in November.

Apparently Sen. John J. Williams (R.-Del.) is not going to try to tack a depletion-cutting rider on a House-passed bill this year.

He let slide an opportunity to do this last week when the Senate acted on a House-approved bill relating to depletion provisions for brick and tile clay.

FAA may announce this week some changes in rig-height reporting rule adopted in July.

Meanwhile, a New Orleans court has ordered a stay in rule's enforcement against AAODC and API members until issue is tried on its merits (p. 65).

Look for western Oklahoma's Blaine County to rival Kingfisher in exploration headlines.

This year's scoreboard for Blaine, which lies just west of Kingfisher: Four gas discoveries out of six attempts, five field gassers out of eight tries. Blaine has only seven official producing areas, but 2 years ago there were none.

Kingfisher itself is still a mighty lively area (p. 162).

It's estimated that number of motor vehicles in U. S. will soar from today's 75 million to 110 million by 1975.

And they'll be used more. Vehicle miles are expected to rise from 720 billion to 1,170 billion in the same period.

Interstate highway system will be important factor in mileage increase. Of 41,000 miles slated to be built, about 11,000 are in use now and 4,400 miles are under construction.

Younger drivers will be target of API campaign to educate motorists on proper oil-change intervals.

API puts intervals at 30 days in winter, 60 in summer—but never exceeding 2,000 miles.

While average motorist changes oil at about 4,300 miles, surveys show older drivers are close to API recommendations.

Market memo

Sept. 18, 1961

Hurricane Carla temporarily tightened Gulf Coast markets.

The big blow inflicted considerable water damage to refineries, loading terminals, and service stations. No stored products were reported lost. But more important—production was halted when a long string of coastal refineries were shut down for several days.

Lost production made **heating oils tighter** at the 8.5-cent price. **Effect on gasoline** was the probable reduction in number of cargoes available for lifting this month. Total had reached a reported 10 or 12 before the storm and they were depressing the market.

Shutdowns on the gulf left **river markets** quiet as a tomb on all products.

Gasoline prices in **Mid-Continent** fell another one-half cent, making the spot price to jobbers range from 10.25 to 10.5 cents. No. 1 is firm at 8.75 cents to jobbers with No. 2 needing colder weather to add strength to its price range of 7.75 to 8 cents.

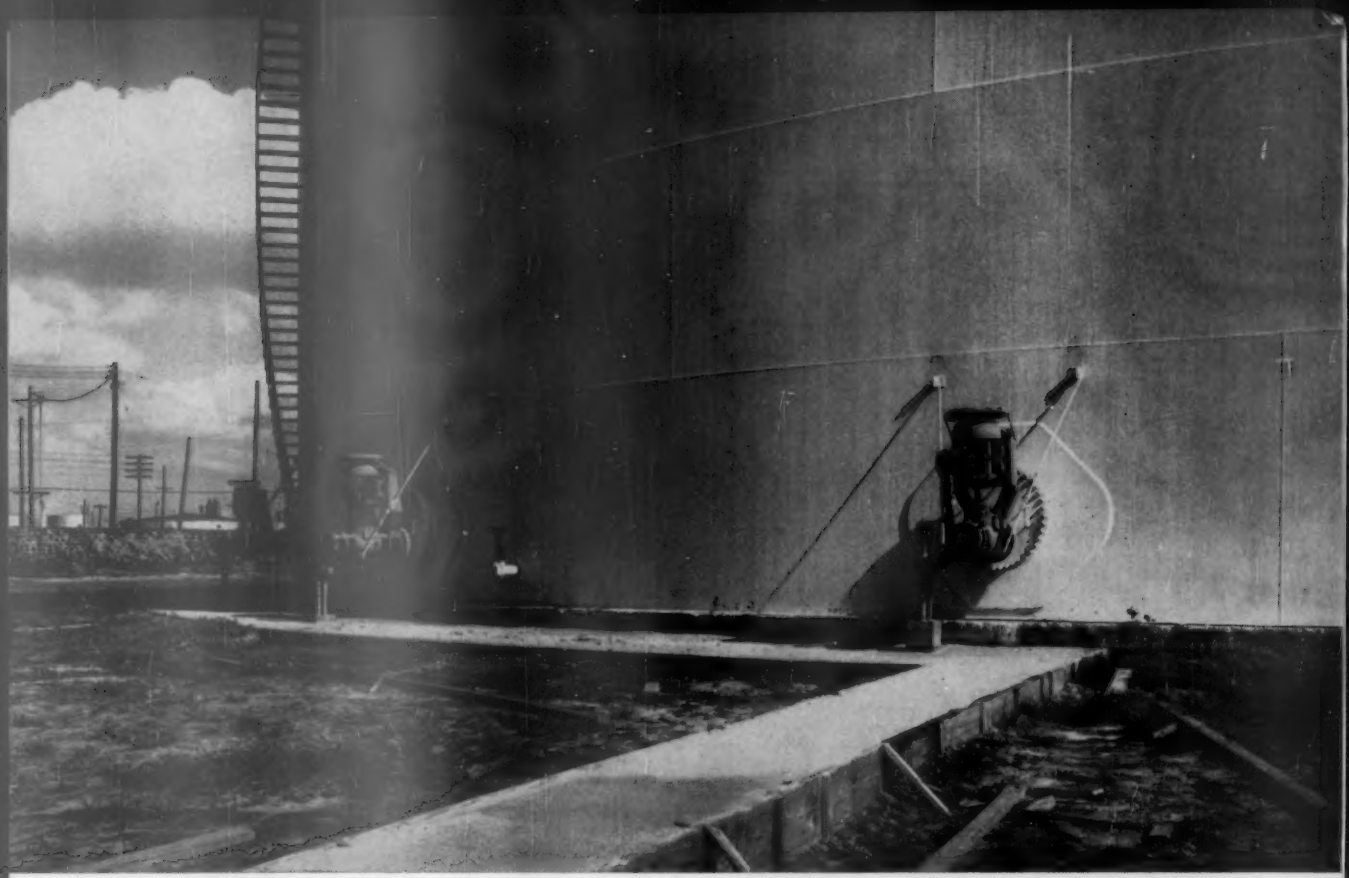
In **retail markets,** Sun now has nine grades in Indianapolis matching Gulftane and private brands at the low end of the scale. Wake-Up Oil also came out with third grade, 2 cents under Gulftane, but withdrew it after 6 days. Other trouble spots in the North and East remained depressed.

Reductions in East Texas crude by Ashland and Scurlock now put 72% of production there at the $3.10 level. Humble, Shell, Texaco, Cities Service, and Indiana still post at the old $3.25 price.

New twists appear in **Mobil's $4-million advertising campaign** boosting Megatane system of rating gasoline quality.

Mobil aims to destroy public image of octane rating system. It plans continuous, sustained program and will use hard-sell technique. Mobil also will introduce two gasolines which rate very high on its new scale (p. 80).

Marketing notes: Lion Oil is making its entry in Gulf Coast marketing with a new service station in Texas City. Lion retails in the Mid-South through more than 2,200 dealer outlets and earlier this year moved into Northeast Texas . . . **See-Way Marketing** of Weston, Ohio, has opened 25 private-brand stations in northern Indiana, plans 75 more this year . . . **Mobil** is planning two big conventions for its dealers in November at Las Vegas, Nev., and Kiamesha, N. Y. Program calls for national speakers, forums and panels, displays of product and equipment suppliers. Mobil claims its dealers have profited from past gatherings held on a smaller scale . . . **Indiana Standard** station operators in Michigan are helping U. S. Army recruiters search for young men with mechanical talents interested in taking special training . . . **Sun Oil's** Frederick B. Hufnagel, Jr., predicts that by 1965 the states will be getting 7% less from gasoline taxes than they planned because the high taxes have become self-defeating. Motorists are finding ways to save on gasoline consumption because of the high taxes . . . **Niagara Falls,** N. Y., police are cracking down on service station dealers violating an ordinance limiting size of gasoline signs and requiring they be attached to the pump.



How they keep crude from **stacking up like pancakes**

Surging into this tank come crudes from wells scattered over 23 counties.

Out of the tank comes *one* crude, at the right gravity to feed to refineries more than 450 miles away.

For the men who run the tank farm, it's no chore at all to blend 122,000 barrels of crudes ranging from less than 20° to above 85° in gravity. They do it by flipping three switches.

The LIGHTNIN Mixers you see here do the rest. While the tank is filling, and for two or three hours before it goes on suction, the mixers create a powerful, steady turnover that breaks up stratification from the bottom up. The outgoing tender of crude stays within a degree or two of constant gravity.

Control BS&W, too. That's not all. These mixers help keep sludge from settling on the tank bottom and stealing valuable storage space. They keep the tank working at its full capacity.

Multiply these savings by the number of tanks at this farm equipped with LIGHTNIN Mixers—and you can see why more than 50 pipeline companies and 35 leading oil companies use this easy way to keep operating costs in line.

How about you? If you'd like to see how LIGHTNIN Mixers on your big tanks can save you as much as $1000 per tank per year, call in your LIGHTNIN representative. He's listed in Composite Catalog. Or write us today.

YOU CAN ADD as much as 12% extra storage capacity to your tank farm—by using LIGHTNIN Mixers to keep tanks free of space-eating sludge. Mixing results are unconditionally guaranteed.

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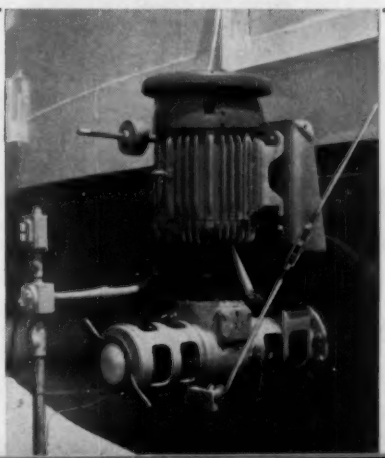
Get these helpful bulletins on BS&W control and LIGHTNIN Mixers. Check, tear out and mail to us today with your name and company address. Free—no obligation.

- ☐ BS&W Control with LIGHTNIN Mixers (B-503)
- ☐ Side-entering mixers, 1 to 25 hp (B-104)
- ☐ Data sheet for figuring mixer requirements (B-107)
- ☐ Condensed catalog describing LIGHTNIN Mixers—all types (B-109)
- ☐ LIGHTNIN rotary mechanical seals to eliminate stuffing-box maintenance (B-111)

MIXING EQUIPMENT CO., INC. 174-j Mt. Read Blvd., Rochester 3, N. Y.

In Canada: Greey Mixing Equipment, Ltd., 100 Miranda Ave., Toronto 19, Ont.

In Europe: Lightnin Mixers, Ltd., Poynton, Cheshire, England



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When you have a small remedial job involving just a few sacks of cementitious material, call your Halliburton Dump Bailer man and watch the savings mount up. SAVE on equipment — no big rental bills on unnecessary pump trucks! SAVE on downtime — no strings of drill pipe or tubing are needed with the wire-line-run bailer! SAVE on material — use and pay for only the amount you need!

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CAL-SEAL . . . a quick setting, super-strength gypsum cement that expands as it sets for a tighter plug.
HYDROMITE . . . a waterproof plastic-gypsum cement used extensively for plugging off bottom hole water in producing wells.
RESIN CEMENT . . . penetrates surrounding formation and sets to form an impermeable seal and strong plug.
HYDRO-LOK (PC-11) . . . a plastic slurry with fluid loss control properties. Setting time of resin phase is accelerated by water contact in the formation.
With these products, plus the long experience your Halliburton man has had with them . . . *and* the special tools Halliburton has developed — like the DB Bridging Basket and Limit Plug, you can expect *top performance* every time you specify Halliburton Dump Bailer Service.

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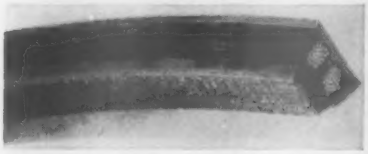
JUST MINUTES AWAY
FROM YOUR WELL!

B.F.Goodrich

V belt briefs

TIPS ON THE CARE, MAINTENANCE AND SELECTION OF V BELTS FOR INDUSTRY

What caused this V belt failure?



Appearance: V belt sidewall and bottom worn away.

Cause: Abrasion. Foreign material and rust in sheaves wore away sidewalls, causing belt to drop to bottom of groove.

Prevention: Use dust guards to protect against abrasion.

Use canvas covers to protect adjustment bolts

Rusty or corroded adjustment bolts at motor base make it difficult to adjust or install a V-belt drive. A simple way to overcome this problem is to cover bolts with a piece of heavy canvas. Then when an adjustment is needed, just lift up the protective canvas cover—adjustment bolts and locking nuts work like new.

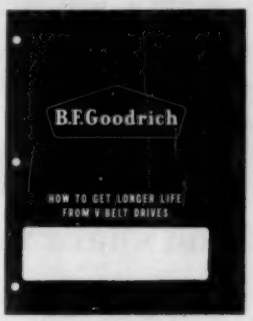
HERE'S WHY GROMMET BELTS GRIP BETTER—*See all the rubber surrounding the twin grommet in this B.F.Goodrich belt? It has more rubber in relation to belt size than any other belt. Because the grommets are endless, have no stiff overlapping cords, they are more flexible, grip the sheaves better. Size for size, Grommet belts give ⅓ more gripping power with less slip. This stronger, more resilient construction gives the B.F.Goodrich Grommet belt 20% to 30% longer life. Yet it costs no more than ordinary belts.*

What do V belt sizes mean?

V belts are marked with a letter which indicates their width across the top and a number to indicate their length. Standard belt widths are coded: A (½″), B (21/32″), C (⅞″), D (1¼″), and E (1½″).

All high capacity V belts will be identified by the addition of the letter "P" as soon as present stocks are used up. For example, AP, BP, CP, DP and EP.

B.F.Goodrich V belt manual



The illustrated pages of this new B.F.Goodrich V belt maintenance manual contain information that will help you get longer life from your V belt drives. Its 12 illustrated pages contain information on how V belts work, how to select V belts that fit, how to install, how to keep them running, and how to spot trouble. To get your free copy, call any of these B.F. Goodrich warehouses: Los Angeles, Great Bend, New Orleans, Shreveport, Hobbs, Oklahoma City, Tulsa, Corpus Christi, Dallas, Houston, Odessa. *B.F.Goodrich Industrial Products Company, Department M-116, Akron 18, Ohio.*

FIRST ADJUSTMENT LASTS TWO YEARS—*The B.F.Goodrich V belt drive on this mud pump stands shock loads, is subjected to all sorts of weather, sand and dirt. Yet it has been working for over two years without a shutdown or takeup since its initial adjustment—and it still needs no further adjustment, looks good for many more years of service.*

B.F.Goodrich V belts

PROTECTION IN DEPTH

How it helps cut compensation costs

How Liberty Mutual saved Compensation Policyholders $24.1 million in 1960
$19.5 million in regular dividends
PLUS
$4.6 million in retrospective refunds

Did you share in these $24,100,000 insurance savings?

You did — if Liberty Mutual handled your workmen's compensation insurance last year.

There are two good reasons why Liberty's compensation policyholders each year save so many millions of dollars. First, it's a matter of record that Liberty Mutual keeps its operating expenses far lower than the average for all other companies in this field. Second, Liberty offers its policyholders the sweeping benefits of protection in depth.

This broad range of services in loss control has helped make Liberty the nation's largest writer of compensation insurance. Last year, it also helped us return $4.6 million under retrospective rating plans and $19.5 million in dividends — $24,100,000 savings to our compensation policyholders. More than that, we helped many policyholders earn experience rating credits which will reduce their future premiums. Liberty Mutual policyholders also enjoy premium discounts allowed under rating plans in the amount of $3.0 million.

If you didn't share in these savings during 1960, just contact your nearest Liberty Mutual office. Find out how Liberty's protection in depth can save you money.

Look for more from

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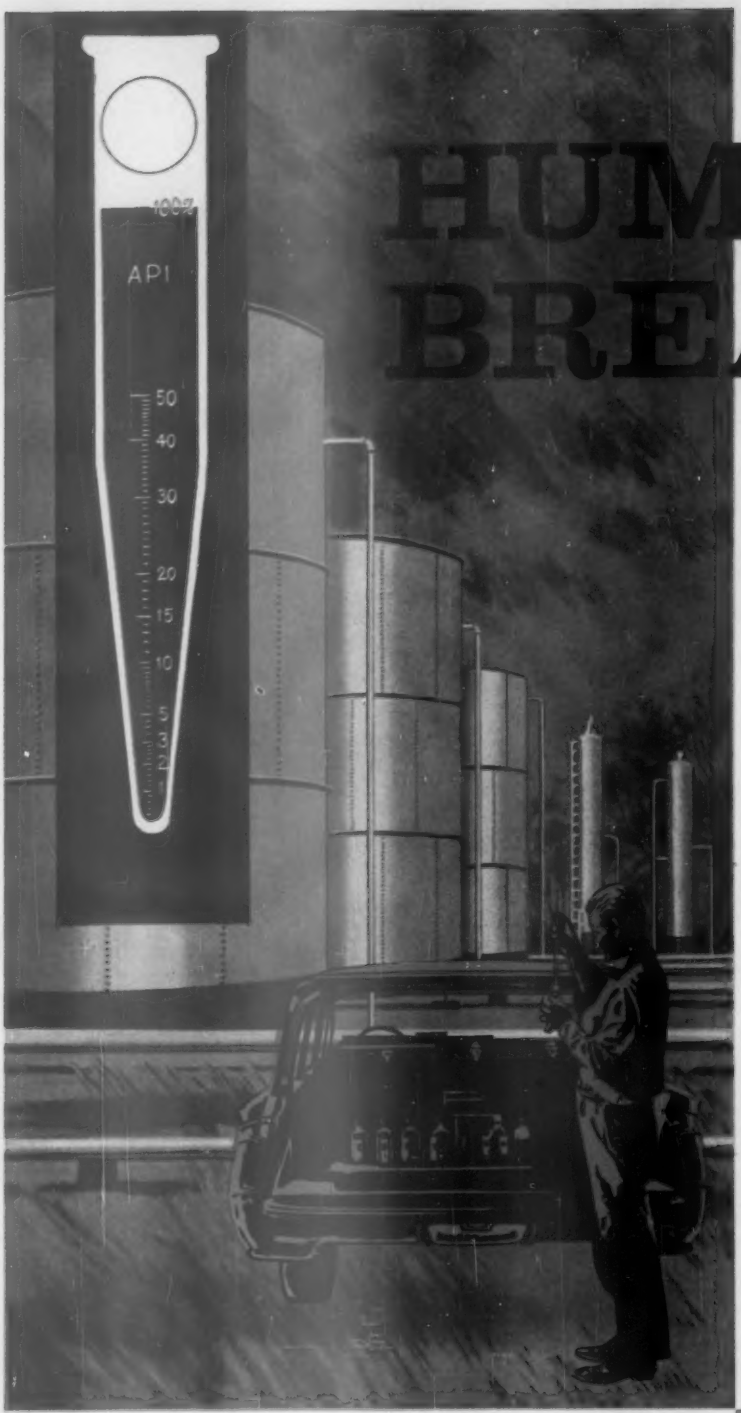

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To get the greatest amount of salable oil from your production, there are many *different* Humble BREAXIT emulsion breakers . . . each designed for efficient treatment of a different concentration of water in the oil. Result?

Users of these specialized BREAXIT formulations report important savings through lowered treating costs and increased recovery.

Find out which BREAXIT will be most profitable in your production. Ask Humble to have its engineers make on-the-lease tests of your emulsions. For more information about BREAXIT, see your Humble salesman, or contact Humble Oil & Refining Company, Houston, Texas.

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America's Leading ENergy COmpany

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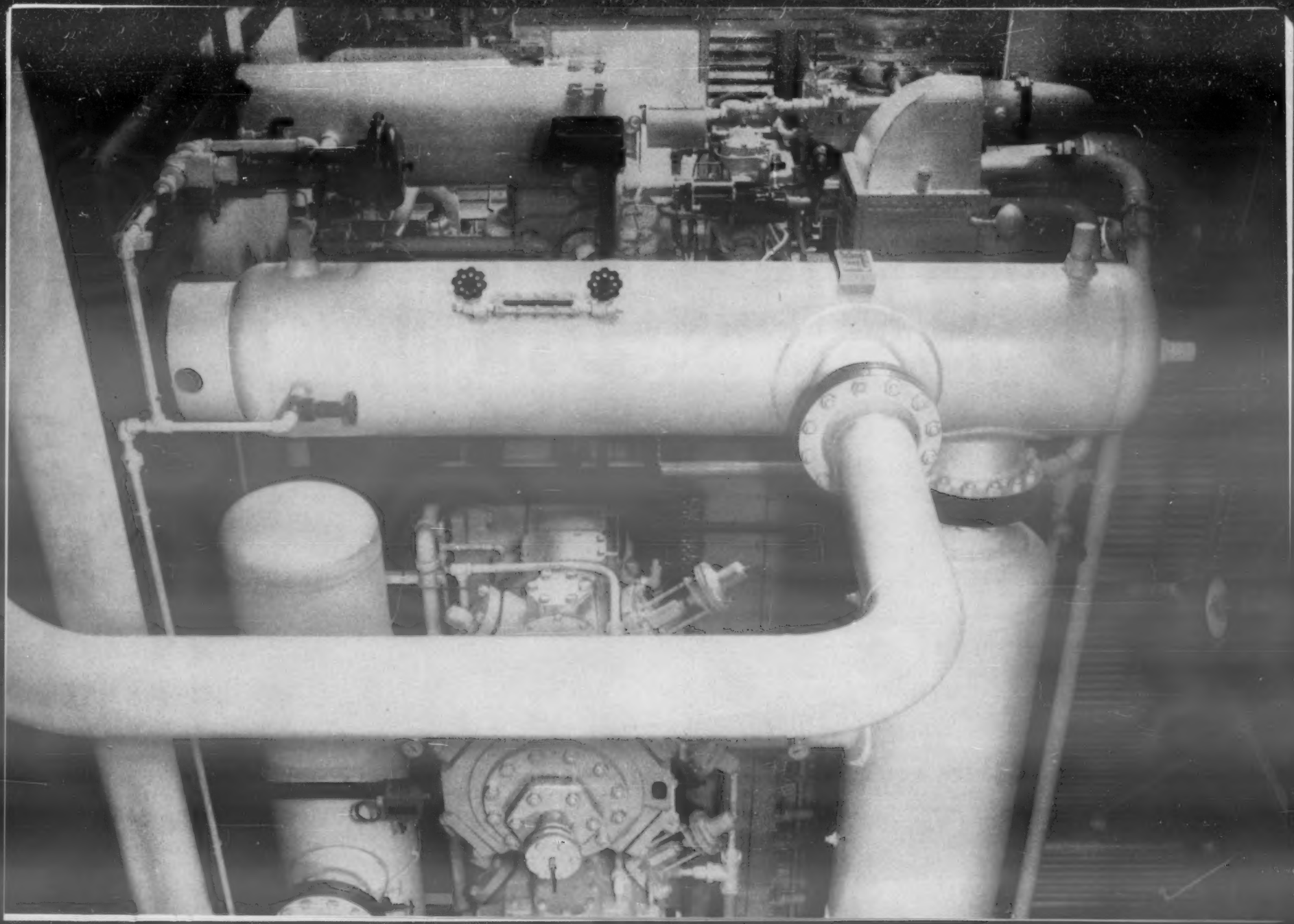

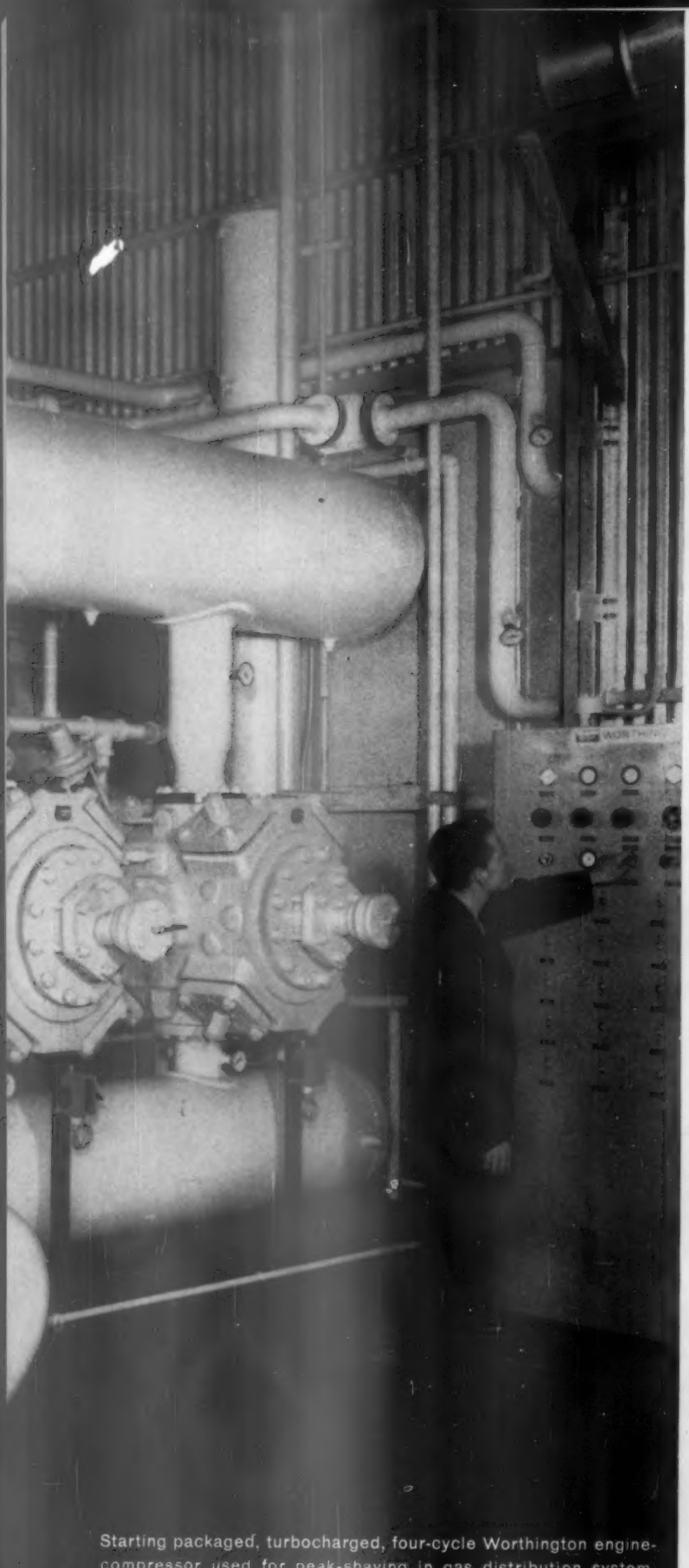

Starting packaged, turbocharged, four-cycle Worthington engine-compressor used for peak-shaving in gas distribution system.

SLHC'S RE-ORDERED TO HELP KEEP DENVER WARM

This winter two more Worthington SLHC engine-compressors will be standing by to help Denver and vicinity through the cold snaps. Then four 575-hp and one 950-hp unit will be ready to respond to 17-mile-away remote control, when normal pipeline capacity is at maximum.

Seventeen miles from Denver, Public Service Company of Colorado is converting an abandoned mine to ultimately store 3 billion cubic feet of gas. During low-load periods, the spare capacity of the present transmission pipeline will be shunted to the mine to charge it to its maximum capacity and pressure—well below normal pipeline pressure.

When the cold snaps hit, Public Service will operate the five Worthington SLHC's to return the gas to its distribution system. First, they will run in parallel on one-stage operation. Then, as the mine pressure falls, automatic controls will switch the system to two-stage by properly sequencing the engine load controls and station yard valves.

There are four basic reasons why the Worthington SLHC's are selected. First, they have excellent performance under the varying torque and speeds encountered on this job. Second, they show the best fuel economy in their class—7000 BTU/bhp/hr at full load. Third, Worthington experience readily adapted them to full pneumatic automation. And fourth, they have a proven record of reliability so essential for the all-out effort they must make in the cold-snaps.

Today, for any under-1000-hp engine-compressor application you should consider the Worthington SLHC. By most value standards, it is the best available today. For further information, please write Worthington Corporation, Dept. 38-1, Buffalo, New York. In Canada, Worthington (Canada) Ltd., Brantford, Ontario.

WORTHINGTON

PRODUCTS THAT WORK FOR YOUR PROFIT

ANOTHER Vogt FIRST

9 NEW FLANGED END FORGED STEEL

GENERAL GP PURPOSE

Gate, Globe and Check VALVES

with

HARD FACED SEATS
150, 300 and 600 ASA STANDARD

featuring:

ASA Standard flanges and face-to-face dimensions
*Stellite hard faced seats and hardened wedges and discs
Spiral wound body-bonnet gaskets
Stainless steel gland studs and nuts
Interchangeable parts
Light weight with maximum strength
Complete line—pressures, sizes and types

*Union Carbide Corp.

Write for Literature. Address Dept. 24A-FO.

Vogt GENERAL GP PURPOSE Vogt FOR BETTER VALVES

HENRY VOGT MACHINE CO., BOX 1918, LOUISVILLE 1, KY.
SALES OFFICES: New York, Chicago, Cleveland, Dallas, Camden, N. J. St. Louis, Charleston, W. Va., Los Angeles

FORGED STEEL
VALVES

YOU Asked for it...

and now it's here!

The New COOPER TC-32

for Well Servicing to 6,000 ft. of 2½" Tubing

HERE ARE ONLY A FEW OF ITS MANY FEATURES:

- Cooper designed and built from the ground up especially for well service — single or double drum models.
- Highly portable in field — keeps up with highway traffic.
- Strong "I" beam frame.
- Diesel, LPG or gasoline engines to 200 h.p.
- Heavy duty synchromesh transmission with or without converter.
- Quiet running torque tube drives which eliminate high speed chains.
- Heavy duty axles front and rear.
- Air brakes on all wheels.
- One man cab equipped for driver comfort.
- Drum brakes with demountable heat treated alloy rims.
- Full air friction drum clutches.
- Drum shaft alloy steel mounted on spherical roller bearings.
- Optional control positions.
- Optional derricks or pipe masts.
- No license required most states.

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FRED E. Cooper, Inc

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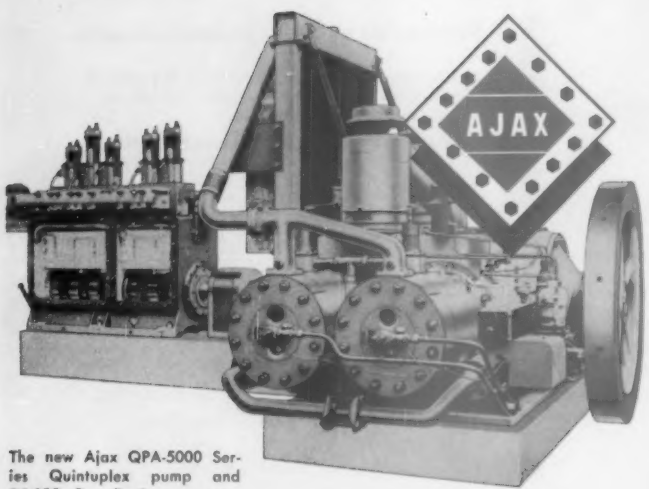
AJAX Gives You DEPENDABLE OPERATING AUTOMATION

With BUILT IN POWER SUPPLY

- **Stark simplicity of operation and servicing — you don't need a specialist.**
- **Control engine speed to load and water requirements.**
- **Engineered to actual horsepower requirements without destructive overload capacity required by instantaneous starting demands**



The new Ajax QPA-5000 Series Quintuplex pump and DP-230 Gas Engine

The need for dependable electrical power still remains one of the weak links in the usual automation installation — especially in remote locations and under certain climate conditions.

Ajax time proved engineering has now solved many of the automation-electrification problems. Automation today is economically sound if the equipment and the installation are designed to meet your particular problems. Contact your Ajax distributor today for the full story on automation without external electrification.

Ajax gives you true economy because of simplicity of design, ease of maintenance, extra long life, and 83 years of quality craftsmanship experience.

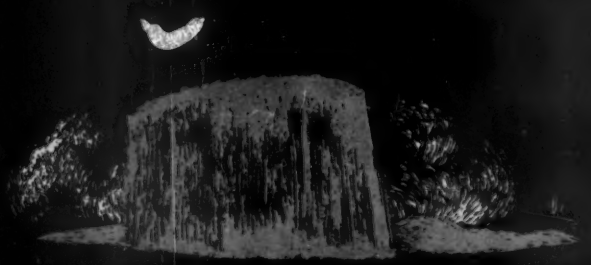
AJAX ENGINES AND PUMPS

AJAX IRON WORKS CORRY, PENNSYLVANIA

Oil Field Distributors

- The National Supply Co. — Pittsburgh, Pennsylvania
- Bethlehem Steel Co. — Supply Division, Tulsa, Oklahoma
- Mid-Continent Supply Co. — Fort Worth, Texas

VISQUEEZ slurry shuts off water where all other methods fail!



BJ Service

An exclusive BJ Service development, Visqueez is the most effective method yet devised to shut off water from producing oil or gas wells. Only Visqueez slurry *thins* on contact with water... penetrating and depositing cement deep into the most troublesome water-bearing formations. A special viscous carrying agent puts a protective coating around the cement particles. The slurry cannot set up until a *pre-timed* chemical action removes the oil coating. No high squeeze pressures... no need for reverse circulation or costly drilling out—excess slurry is recovered as free-flowing oil and cement. With BJ Service Visqueez, the well is back on production in 24 hours or less!

For complete details, call your local BJ Service field station today.

Results talk!

Visqueez Increases Oil Production 30%— Decreases Water Production 27%

PROBLEM: To lower the water/oil ratio of the producing wells in a water-flood system in Wyoming. SOLUTION: Visqueez was used to treat 16 producing wells with an aggregate production of 10,883 BWPD and 897 BOPD. Following Visqueez treatments, water production has decreased to 7,983 BPD and oil production has increased to 1,169 BPD. Over-all results: water production down 27%—net oil production *up* 30%.

BJ SERVICE, INC.

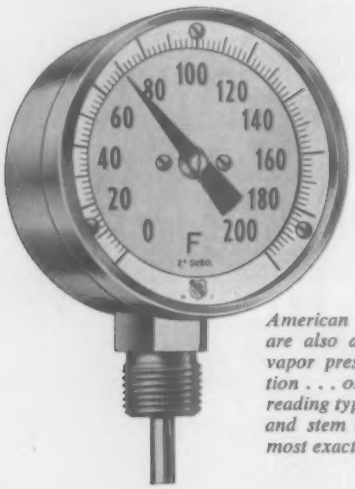
A BORG-WARNER SUBSIDIARY

Long Beach, California • Arlington, Texas • Stations in all major oil fields

BJ B-W SERVICE

sharp

AMERICAN BI-METAL THERMOMETERS make accurate temperature readings sharp and sure at all check points



American Dial Thermometers are also available in mercury, vapor pressure, and gas actuation . . . on-the-spot and distant reading types . . . in sizes, ranges and stem lengths to meet your most exacting requirements.

sensitive

Any way you look at an American Bi-Metal Thermometer, you see exact working temperatures.

The two-level "Maxivision®" dial eliminates parallax effects. Numerals are on the lower level. Graduations are on the outer raised ring dial which presents a sheared edge to the tip of the pointer and in the same plane. To make readability even more accurate, the glass and graduated dial are closely spaced.

American Bi-Metal Thermometers are made of weather-proof stainless steel. All joints are welded to solid unity, then polished smooth so corrosion won't build up and destroy the thermometer's usefulness. And, you don't have to discard this thermometer even if the glass is ever broken. The bayonet lock bezel makes replacement easy.

Learn about the high sustained accuracy and long service life built into American Bi-Metal Thermometers. Phone your nearby industrial supply distributor for help in selecting the right type for each temperature check point in your plant. Or write for Catalog 155.

MANNING MAXWELL & MOORE M&M TRADE MARK

AMERICAN INDUSTRIAL THERMOMETERS

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Where pumps are pampered

Repair service for subsurface pumps is a Bethlehem specialty

Bethlehem pump shops are staffed with experts—men with practical experience in the repair and operation of subsurface pumps. Every one of our shops has complete repair facilities and a full stock of replacement parts. Bethlehem pump experts can quickly diagnose the ills of any troublesome or worn-out pump. And they can put it back into top shape in a hurry.

Select a Beeline pump from our complete line

Bethlehem's the place to shop for new pumps, too. Our popular *Beeline* series of subsurface precision pumps includes one which will meet your needs exactly, whatever the condition of your well. Each *Beeline* pump is engineered to the same high standards which characterize all Bethlehem equipment.

Whether you need a new pump or repairs on a used one, check with a Bethlehem pump shop. You'll find one near you.

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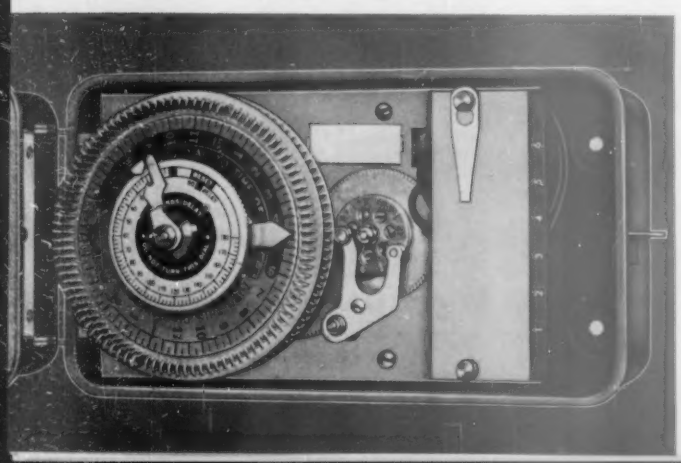
Supply Division
General Offices and Export Dept.: 21 East Second St., Tulsa, Okla.

BETHLEHEM STEEL

BETHLEHEM STEEL SUPPLY DIVISION

Supertimer performs two major functions in a single unit: 1) programs minutes per hour, hours per day, days per week in pumping schedule. 2) Provides 73 accurately controlled re-starting intervals (zero seconds to 3 minutes). Simultaneous re-starting of any of 73 pumps after power interruption can be prevented by this timer's sequence starting feature.

C-H automatic pump-off control ends dry pumping. An electrically self-heated thermistor measures fluid flow. When well pumps off, thermistor signals transistorized relay that shuts off pump. *Fluid flow* is the sole gauge—no other factors influence pump off. Field tests prove lower oil lifting costs, pumping time savings up to 25%, electricity savings and elimination of severe dry pumping wear.



3-coil protection and day omission features are now standard on Cutler-Hammer controllers

Programmed pumping has made 3-coil overload relay and day omitting features so essential that these "extra options" are the rule in today's pumping operations. Cutler-Hammer has now incorporated both of these design features in the standard line of Three Star oil well pumping control.

3-Coil Overload Relays

These new Cutler-Hammer standard units —size 0 through 4—equipped with 3-coil overload relays provide the ultimate in motor protection—particularly for isolated, inaccessible, or unattended applications. For pump motor protection against overloads, single phasing and unbalanced line voltage conditions, get this additional protection *as part of a standard controller.*

Cutler-Hammer automatically starts, stops and cycles your pumping program to your exact schedule. A simple screw turn permits you to automatically omit any of seven days from your pumping schedule. You get this extra day omitting convenience *as a standard design feature when you specify Cutler-Hammer.*

It is extra features like this—as part of standard controller design—that have made Cutler-Hammer the far-ahead leader in oil well control. For details on twenty-one other C-H design features, write for Pub. LO-16-S275 . . . better yet, call your local distributor or sales office for details.

WHAT'S NEW? ASK...

CUTLER-HAMMER

Cutler-Hammer Inc., Milwaukee, Wisconsin • Division: Airborne Instruments Laboratory • Subsidiary: Cutler-Hammer International, C. A. • Associates: Cutler-Hammer Canada, Ltd.; Cutler-Hammer Mexicana, S. A.

The "OILWELL" string...

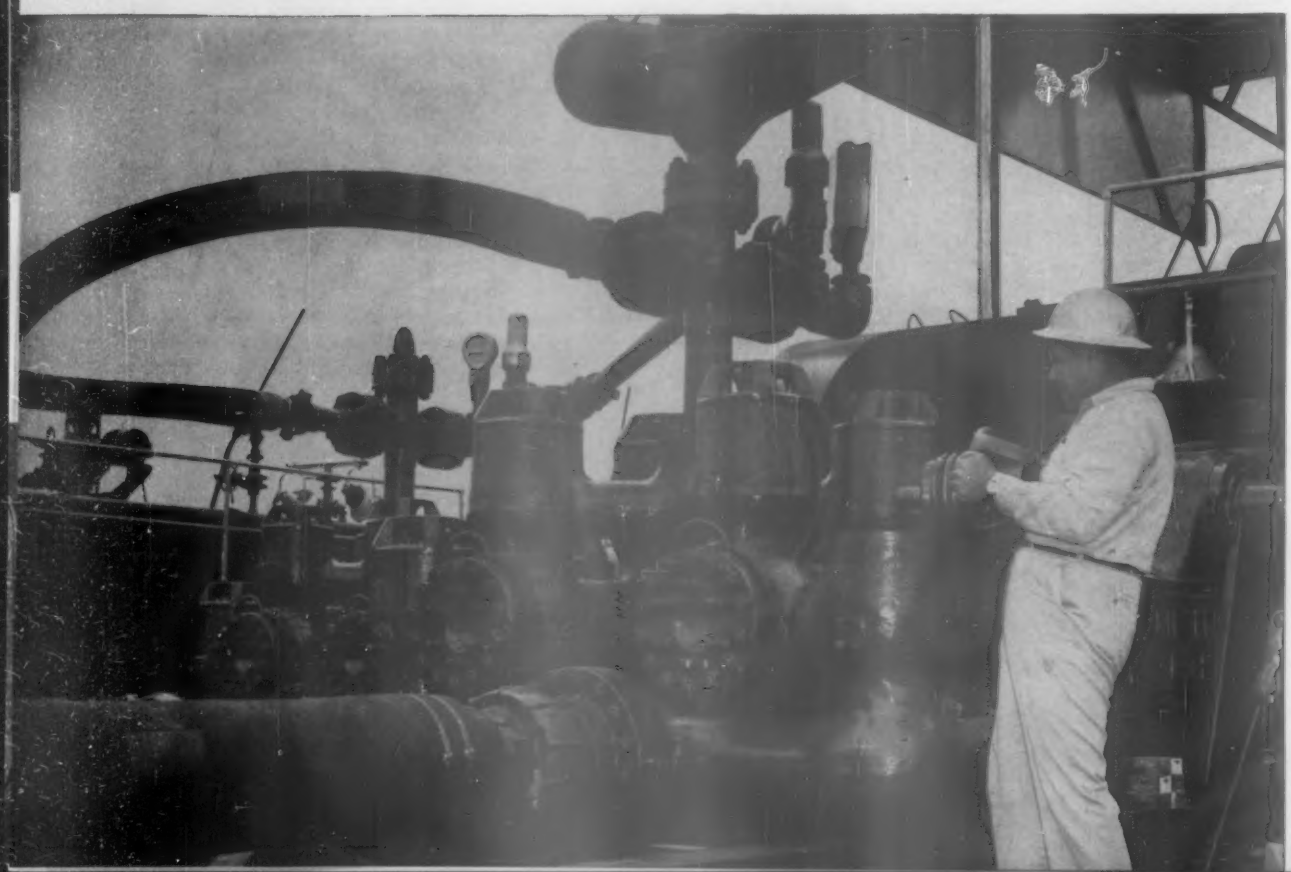
PRODUCTS
SERVICES
STORES

The right way to use a slush fund... buy "Oilwell" Fluid End Parts

Genuine "Oilwell" Fluid End Replacement Parts are made to the same high standard of quality and workmanship as your original "Oilwell" and Wilson-Snyder slush pumps. They are designed to the exact requirements of your equipment. They suit the hydraulic conditions for which your pumps were designed. And, because each part is carefully packaged in its own protective container, you'll find it clean and ready-to-use when you need it. If you want top performance, minimum down time, and low-cost operation, use only genuine "Oilwell" Fluid End Replacement Parts. Your nearest "Oilwell" store stocks them . . . as well as a variety of other maintenance supplies.

These are prime examples: DI-HARD LINERS—give much longer service with little extra cost.
HI-HARD PISTON RODS—have *hard* wearing surface on high tensile core.
CHROMEX PISTON RODS—have extra coat of chrome.
"4-on-1" PISTONS—have the *never-wear-out* body.
VALVES AND SEATS—have more metal-to-metal contact plus greater flow area.
ROD PACKING, LINER PACKING AND GASKETS—are made to rigid specifications.

USS, "Oilwell", DI-HARD, HI-HARD and CHROMEX are registered trademarks

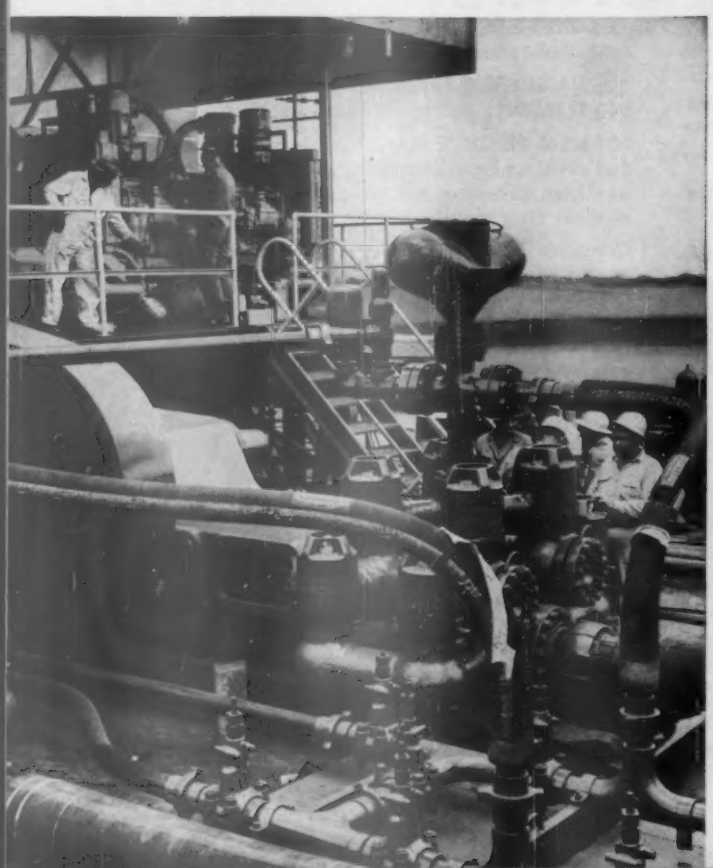


How's this for engineering service?

Want a land draw works and drive adapted to the space limitations of a particular offshore platform? Need special unitizing designed for your pumps? Or help in selecting the most suitable rig components for a specific job? There's one man who can give you the solutions to these and many other ticklish problems: your "Oilwell" field engineer.

There's an "Oilwell" engineer near you, and you can be sure he will see that you get the most economical operation out of your "Oilwell" equipment. If you are looking at new equipment, he'll see to it you don't "over-buy." If you're heavying-up or considering slim hole work, his know-how will prove of real assistance.

The next time you're rigging up or buying new machinery, call in the "Oilwell" engineer. He'll show you how planning pays off. And his advice is free.



If you're rigging up, don't forget friction tape

Or any one of a hundred other small but essential supplies that you'll need on your rig. Make a list of everything you think you'll need, then give your list to the nearest "Oilwell" store. We'll make sure you haven't left anything out. We're familiar with your needs, and we carry it all. "Oilwell" stores sell not only major items of drilling equipment, but also those innumerable little items like fuses, friction tape, hammers, axe and sledge handles, solder, wiping rags, even flashlight batteries. Get it all, all at once, from your "Oilwell" store.

USS TRADEMARK

Oil Well Supply Division of United States Steel

Executive and Export Offices: Dallas, Texas

"This GUIBERSON DRILLABLE PACKER runs, sets and drills faster than any other permanent packer"

HERE'S WHY!

Guiberson Type A Drillable Packer..

REDUCES PREMATURE SETTING Casing drag and junk impact are transmitted through the mandrel shoulder directly to tubing string.

REQUIRES ONLY ONE-HALF TUBING TRIP to set and place in production . . sets on wire line, too.

REQUIRES LESS SETTING FORCE Spring loaded lower slips are held drag-free from the casing until packer is set . . teeth remain sharp.

REQUIRES LESS DRILLING TO REMOVE Top slips are first part drilled. After drilling through them, packer can be fished out, or ½ to ⅔ of packer can be drilled and rest pushed to bottom of hole.

USES A SUPERIOR, OIL FIELD PROVED PACKING ELEMENT . . made in Guiberson plant.

FORMS A POSITIVE SEAL Unique internal mandrel shoulder expands packing element. All weight and high pressures are transmitted to packing element for a positive seal.

Compare Guiberson Drillable Packers for single or multiple-zone production . . acidizing . . pressuring operations . . water-flooding . . testing . . corrosion control . . many other completion jobs. Their speed and efficiency of setting and positive seal cut operating and replacement costs.

There's a Guiberson packer for every drillable packer application . . See your Guiberson man

TYPE A — With flapper valve and junk pusher

TYPE AN — No flapper valve.

TYPE AG — No flapper valve . . has guide body in place of junk pusher

TYPE AT — Has integral tail pipe connection . . no flapper valve

TYPE W — Small diameter . . wire line set only

TYPE AR — Small mandrel ID . . with flapper valve

TYPE ANR — Small mandrel ID . . no flapper valve

TYPE AGR — Small mandrel ID . . has guide body

TYPE A2R — Doubly restricted mandrel ID

Better be Safe than Sorry — go Guiberson

THE GUIBERSON CORPORATION
DALLAS, TEXAS. U. S. A.

BETTER BE SAFE THAN SORRY GUIBERSON

DRESSER INDUSTRIES INC.

PRODUCTION, DRILLING AND WORKOVER SPECIALTIES, MOLDED RUBBER PRODUCTS

OIL • GAS • ELECTRONICS CHEMICAL • INDUSTRIAL

Announcing

THE CLARK CFB-4

750 bhp...and it TRAILER MOUNTS

with ease!

High horsepower in a packaged field compressor—that's the new Clark CFB-4. Extending the Clark CFA-CFB line to 750 bhp, this heavy duty unit is specifically designed for the most rugged kind of field service. It offers you the power you need in a package so compact and so easy to install that you can get it on stream in a matter of hours.

Shown is a trailer mounted unit designed for air drilling. When mounted on a skid, the CFB-4 is equally at home in all other field services, providing dependable performance that has been proved in over 200 similar machines already in use.

There's practically no vibration and extremely little wear with the Clark Balanced/Opposed compressor. Gas can be compressed in as many as four stages to assure low interstage temperatures, low discharge temperature and long valve life. Multiple staging also means lower pressure rise across each cylinder, hence less loading on compressor connecting rods and pins.

The CFB-4 is direct connected to a proven oil field engine and operates at modern 1000 rpm speeds. A single unitized radiator with vertical air discharge provides all cooling services for both engine and compressor. Automatic shutdown devices and other controls can be furnished to permit completely unattended operation.

For more details, contact your nearest Clark representative, or write to:

CLARK BROS. CO., OLEAN, N. Y.

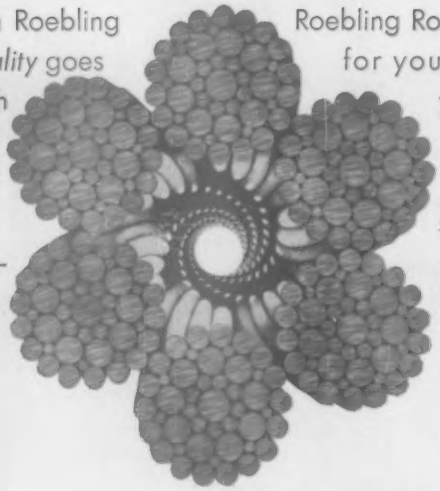
CLARK® DRESSER INDUSTRIES INC.
OIL • GAS • CHEMICAL
ELECTRONIC • INDUSTRIAL

Working together in allied industries . . .

ROOTS® CONNERSVILLE — *Blowers, Compressors, Gas Pumps, Rootsmeters, Vacuum Blowers*

PODBIELNIAK — *Centrifugal Contactors, Distillation Apparatus, Instrumentation*

Profit from the inside story on Roebling Royal Blue Wire Rope—the *quality* goes all the way through. Extra high strength in conjunction with uniformity of rope construction means unequalled resistance to wear and tear — and a whopping increase in service life. That is why every inch of Roebling Royal Blue pays off on the job for you. Get all the details from your wire rope distributor, or write for free booklet to Roebling's Wire Rope Division, Trenton 2, New Jersey.



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Quality inside and outside

We put a lot of work into it — You get a lot of work out of it

There are many Styles of Diamond Bits . . .

. . because Christensen "custom engineers" diamond bits to overcome particular problems. On that next drilling, coring, reaming, or fishing job, ask your nearest Christensen office about diamond bits designed for you

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CHRISTENSEN DIAMOND PRODUCTS

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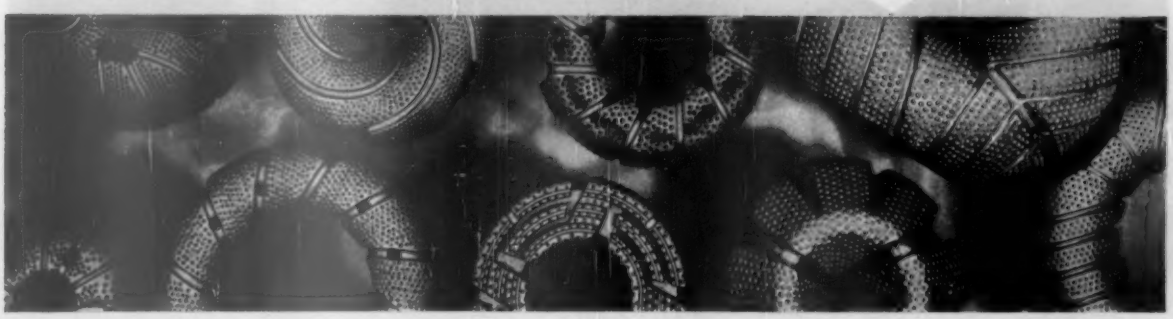


the case for using a SWACO D-GASSER on most of the wells you drill

Many operators and drilling contractors don't realize how D-Gassers can help them reduce the over-all cost of wells. By removing entrained gas and air from drilling mud after each circulation, the D-Gasser permits improved control of mud characteristics. As a result, many operators can profit from some of the following savings:

SAVES MUD AND CHEMICALS. If gas-cutting is encountered, the chances are good you can save on mud bills. The D-Gasser usually permits drilling without adding weighting material even though the well is "kicking" from drilled gas. It has been possible to keep mud weights more than a pound lighter than would have been possible without the D-Gasser. Over-treatment of mud (and the resulting stuck pipe and formation trouble) can be avoided when the D-Gasser is used. Trip gas and viscosity increases due to dissolved and entrained gas may be controlled without costly and time-consuming mud treatment.

SAVES LOST CIRCULATION MATERIALS. Since the D-Gasser often makes it possible to continue drilling while the well is "kicking", lighter mud can be used and lost circulation problems may be held to a minimum.

PERMITS FASTER, LOWER COST DRILLING. Drilling rates and/or footage per bit may be increased since light, low-solid muds may be used. Total drilling time may be reduced and fewer round trips may be required.

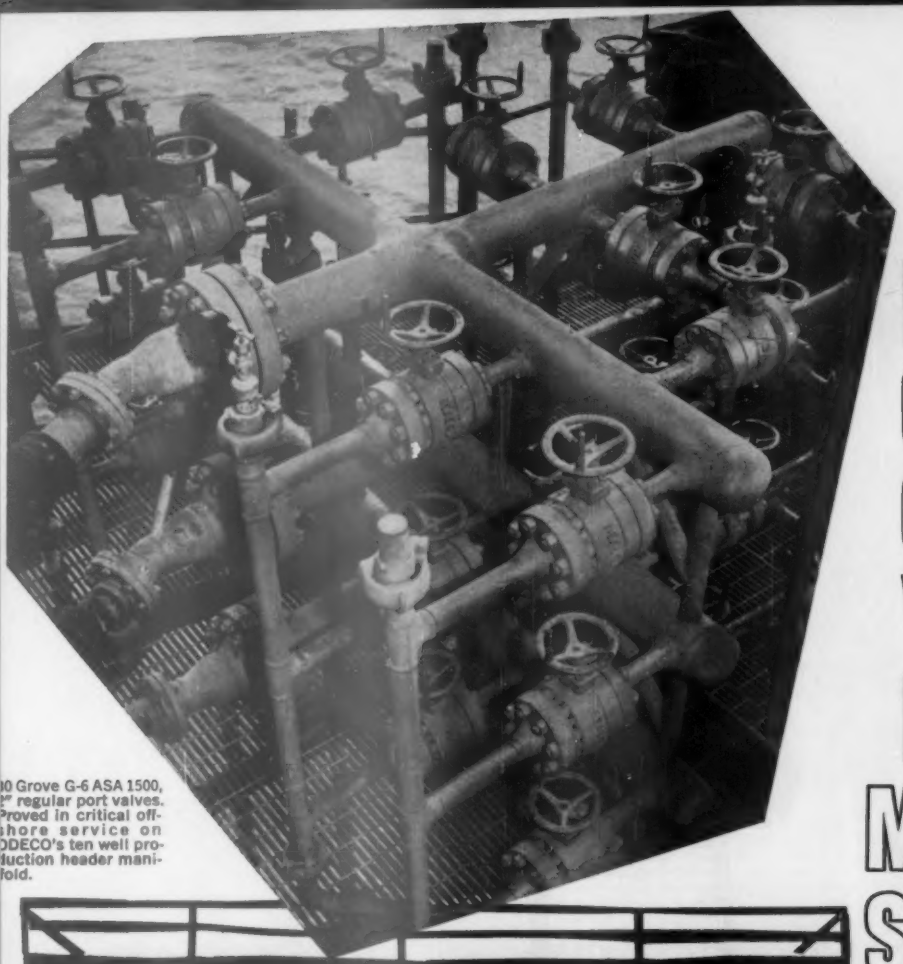
SAVES CASING. Frequently, operators avoid the expense of setting a long string just to evaluate a minor gas show. By eliminating the recirculation of gas, the D-Gasser prevents exaggerated impressions from minor shows. Occasionally, it has been possible to save an intermediate string when a D-Gasser is used.

SAVES WELLS. Many high pressure exploratory wells have actually been saved by the D-Gasser. Costly blowouts, fires and lost holes have been avoided. For full information on how the D-Gasser can help you, contact your nearest SWACO representative or write us direct.

SWACO

SALT WATER CONTROL, INC.
717 FT. WORTH NATIONAL BANK BLDG., FORT WORTH 2, TEXAS
Telephone: EDison 2-4433 Cable Address: "SWACO" Fort Worth

LOUISIANA: New Orleans, Lafayette
OKLAHOMA: Oklahoma City
TEXAS: Houston, Corpus Christi, Fort Worth, Kermit
NEW MEXICO: Farmington



)0 Grove G-6 ASA 1500, 2" regular port valves. Proved in critical off-shore service on ODECO's ten well production header manifold.

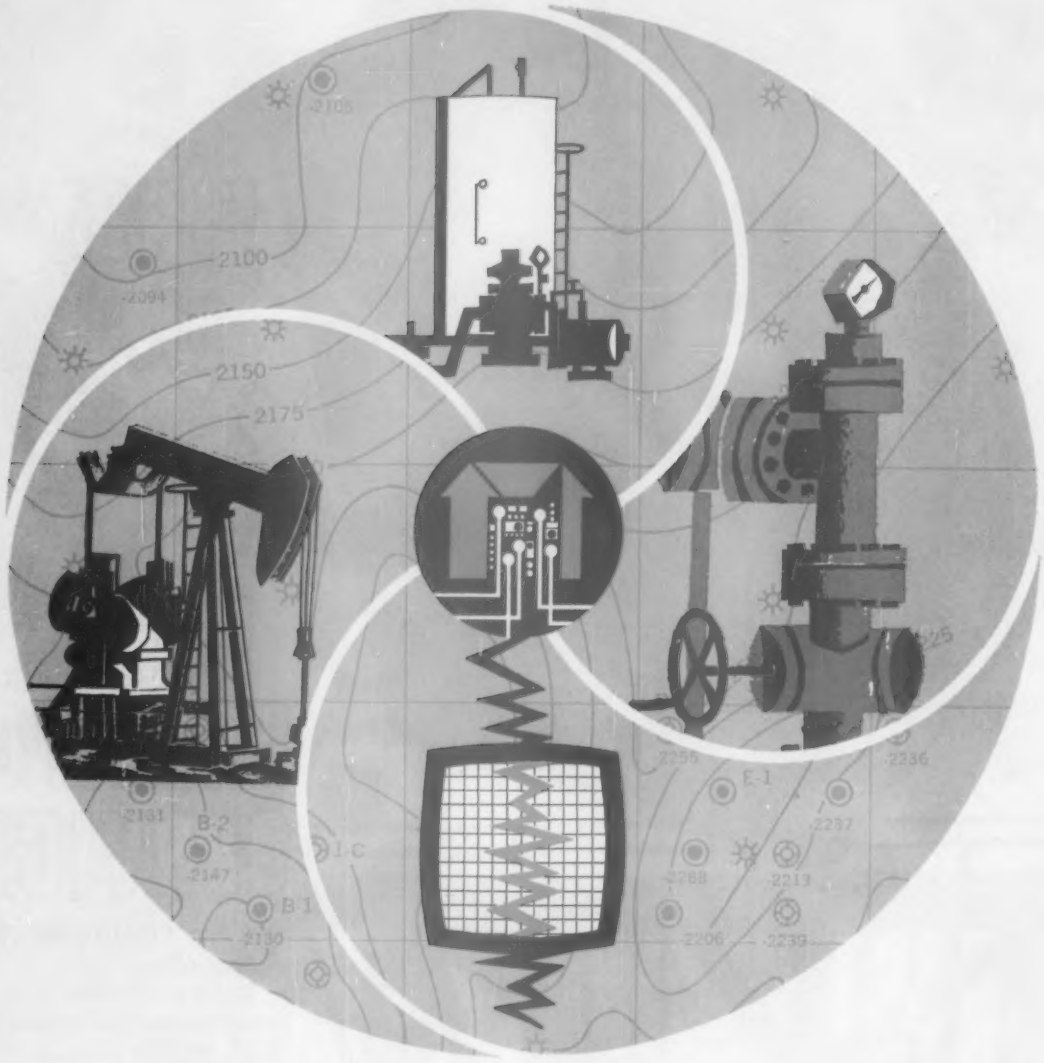
FIRST COMPACT GATE VALVE FOR MANIFOLD SERVICE

With Flow Characteristics Superior to Plug Valves.

Though reduced to a compact 14⅜" overall height, new Grove G-6 valves provide a round opening for ideal flow characteristics. G-6 Regular Port Valves feature field proved Grove Seal-"O"-Ring® system that provides a primary, positive metal-to-metal seal backed up by o-rings to assure bubble-tight closing. And because G-6 valves never need lubrication or sealing compounds, these maintenance costs are eliminated. Designed for flow lines, tubing and casing heads, wing valve and manifold services. 2" size in ASA 900, 1,500 and API 3,000#, 5,000# wog.

GROVE VALVES

GROVE VALVE AND REGULATOR COMPANY
a subsidiary of Walworth
6529 Hollis Street, Oakland 8, California
Offices throughout the U. S. and in Western Canada



Look to Parsons for Performance in
AUTOMATIC CONTROL SYSTEMS FOR PETROLEUM PRODUCTION

Now, with PARACS* you can cut production costs to the bone... You can take advantage of lease consolidation... You can have a system designed to meet the characteristics of a single lease or multiple leases... You can benefit from the experience background of over 40 automated oil field leases... You can get all the advantages of total capability with single source responsibility. Bulletin 12-31 has the facts about PARACS—send for your copy today.

*PARSONS AUTOMATIC CONTROL SYSTEMS

PARSONS *Electronics*

THE RALPH M. PARSONS COMPANY

ELECTRONICS DIVISION

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WORLD WIDE SERVICES: APPRAISALS AND ECONOMIC STUDIES • ARCHITECT-ENGINEERING • CONSTRUCTION • ELECTRONIC SYSTEMS AND COMPONENTS • MINING AND METALLURGICAL ENGINEERING • PERSONNEL TRAINING • PETROLEUM-CHEMICAL ENGINEERING PETROLEUM PRODUCTION SYSTEMS • PLANT OPERATION • POWER PLANT ENGINEERING • WATER DEVELOPMENT AND SYSTEMS

MARVEL® Treater Helps Good Emulsion-Breakers Work Better

Reduced Operating Costs and Better Oil to Storage Possible with New Visco Mechanical Aid

Visco now has the means to do a thorough dispersion job on emulsion-breaking chemicals, even in viscous, low-gravity oils. It is the Marvel® Treater, a patented mechanical dispersion aid which Visco has available for either lease or sale through your Visco Representative. The Marvel Treater increases efficiency of emulsion-breaking chemicals by insuring that they are thoroughly dispersed in crude oil – and this increased efficiency usually means less chemical is required and/or lower treating temperature.

The Marvel Treater is installed in the flow line so that all fluid going to the treating unit passes through it. Crude enters a slot and baffle arrangement in the Marvel Treater, which completely disperses the emulsion breaker in the oil. However, this dispersion process causes no pressure loss between the inlet and outlet of the treater—it will handle the same amount of fluid as will the line on which it is installed.

Simple to install, the Marvel Treater can be put into place in minutes by field personnel, and is available in sizes to fit, 2, 3, 4 or 6-inch lines.

Field Reports of Marvel Treater Efficiency

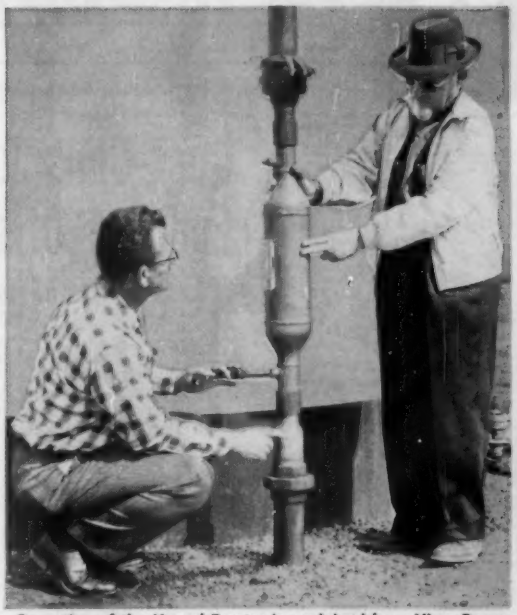
Here are a few reports made by Visco Representatives after field-testing the Marvel Treater—testimony as to what the treater can do for you:

Western Oklahoma

"The pumper and superintendent agreed to the installation of a 3-inch Marvel Treater. They have been using butane at a cost of about $100 a month for heating. Two days after the treater was installed, we cut the heat off and the oil has been going to stock better than it ever was. We are getting perfect oil to stock plus a one-degree increase in gravity."

Southern Oklahoma

"They have a 10' x 27' treater that carried 180° heat. The oil was 26° gravity . . . going to stock at 0.8%, and they had to bleed about five inches of water off each tank before they could run it. We installed a Marvel Treater three weeks ago and cut off the heat two hours after installing it. Since then, they have sold a tank a day and the Marvel Treater has not only saved the cost of the butane, which was $25 a day, but has resulted in a 2° increase in gravity, which is 4¢ more per barrel of produced oil."



Operation of the Marvel Treater is explained by a Visco Representative (at left) to a lease operator. The new treating device effects maximum mixing of emulsion breaker chemical with produced fluid, has enabled many operators to reduce heat, cut chemical requirements and produce oil of increased gravity.

Southern Kansas

"An oil company had a new wildcat well producing 19° gravity oil with a pour point of 51°F. Their analysis showed this oil to be 54% asphalt, and the grindout showed 21% B.S.&W. After a two-week treating period the cuts were still going to stock at 2.3%. Marvel Treater was recommended and the customer agreed to a 30-day test. Two days after the Marvel Treater was installed, the oil going to stock ground out 0.4% . . ."

These examples indicate what the Marvel Treater has been able to do for other oil producers. It can probably help you in the same way. Why not call your Visco Representative and talk over your problems with him? Or, write directly to Visco Products Company for details.

VISCO PRODUCTS COMPANY
Incorporated
A Subsidiary of Nalco Chemical Company
P.O. Box 87 Sugar Land, Texas

Visco® ... *consistently efficient oil field chemicals*

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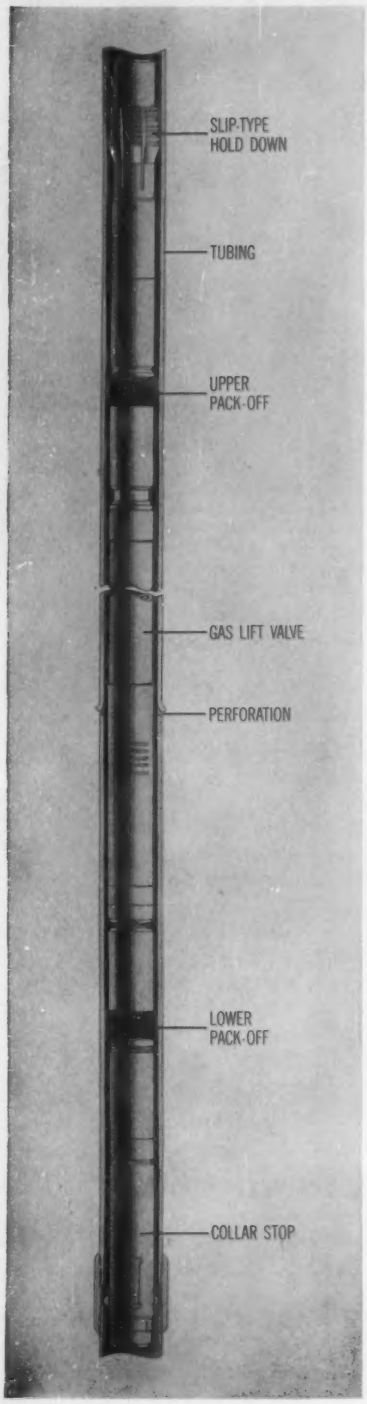
SPECIAL REPORT TO MANAGEMENT

OTIS PRODUCTION NEWS

Volume II, Number 3 **Otis Engineering Corporation • Dallas** *Production Equipment and Services*

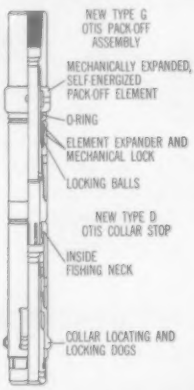


Cost-Conscious Producing Companies Endorse Otis All Wire Line Technique Of Converting Wells to Gas Lift

CORPUS CHRISTI—Eliminate the cost of a pulling unit to round-trip tubing when converting a well to gas lift and you can save an impressive amount of money per well. That's what several of the major producing companies in this area discovered when they started using the new Otis "All-Wire-Line" Gas Lift Conversion Technique.

A spokesman for one of these majors recently stated that his company is most enthusiastic about the technique — especially for water locations — because "(1) it's faster, (2) it's less expensive, (3) it's every bit as efficient as other types of installations they have made, and (4) it eliminates the risk of damage to the producing formation from contamination by mud and/or water in the annulus." Another company reported a savings of $60,000 in converting three, readily accessible, land locations.

As an example of how the technique can reduce the cost of a conversion, take a look at the following case history: A 6800-foot well located in approximately three feet of water in the Copano Bay Field ceased to flow naturally and was scheduled to be put on gas lift. In making plans to have the work done, it was discovered the approach canal had filled with silt and sand, which meant an expensive dredging operation would be necessary before a barge-mounted workover unit could be moved onto location; cost of a workover unit would be $1400 per day, and the annulus was loaded with old drilling fluid. Estimated conversion costs were mounting fast. A conference with the Otis Gas Lift Specialist in the area convinced the operator he should try a Type CG Otis Pack-Off Gas Lift Valve installation.


NEW TYPE G OTIS PACK-OFF ASSEMBLY
MECHANICALLY EXPANDED, SELF-ENERGIZED PACK-OFF ELEMENT
O-RING
ELEMENT EXPANDER AND MECHANICAL LOCK
LOCKING BALLS
NEW TYPE D OTIS COLLAR STOP
INSIDE FISHING NECK
COLLAR LOCATING AND LOCKING DOGS

Straight through, full opening bore of pack-offs, collar stop, and gas lift valve permits maximum production with minimum turbulence.

©1960 O.E.C.

After setting a circulating plug in the tubing at the spot indicated for the lowermost valve, perforating and circulating mud from the annulus, it took the trained Otis Wire Line Specialist only 15½ hours of wire line time to perforate and install five concentric Type C Gas Lift Valves between Type G Otis Pack-Off Assemblies and have the well ready to be put back on production. Eight months following the conversion, the well was still making its allowable in an economical and efficient manner. And to attest to the reliability of the new Type G Otis Pack-Off Assemblies, the well was being produced from the lower-most valve.

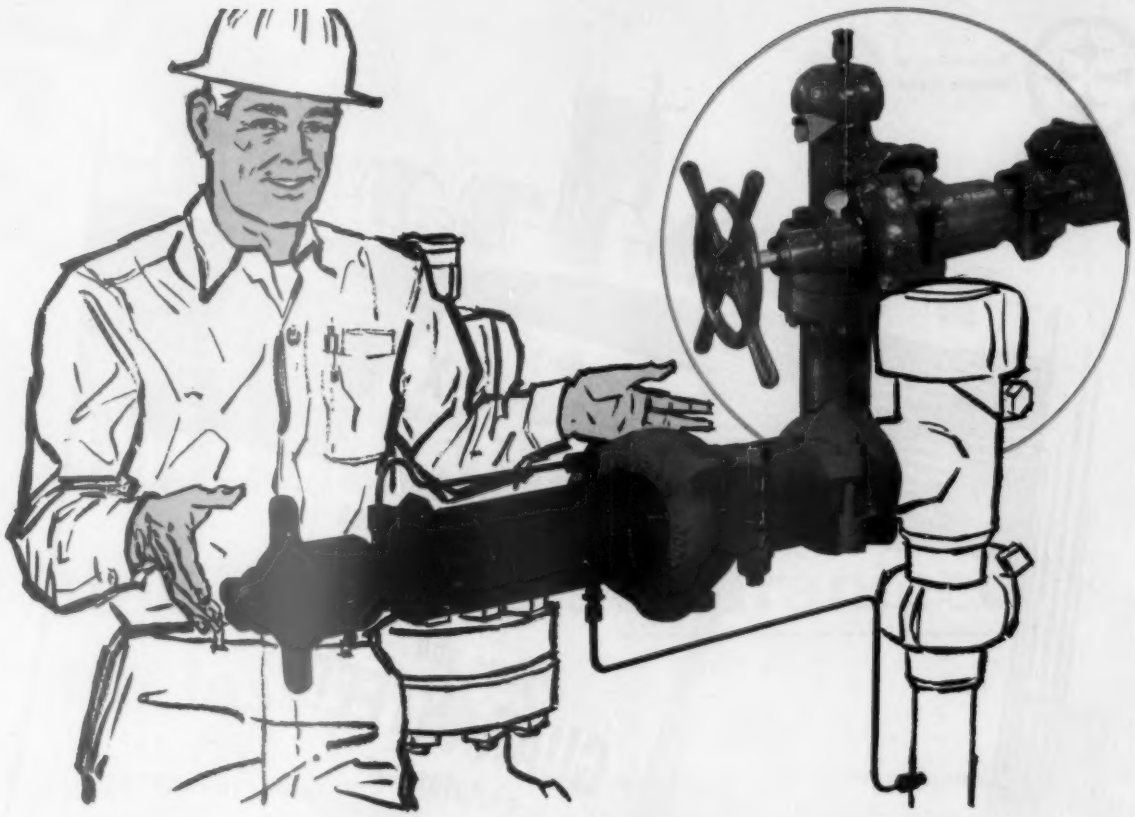
Otis Gas Lift and Completion Specialists are interested in helping you find a way to complete and produce your wells in the most efficient manner. The experience these men have accrued throughout the years is yours to draw from when faced with any down well completion or production flow control problem. Use the knowledge these men have to offer and you will find you'll be spending your production dollars more efficiently. For more information on the Type CG Otis Pack-Off Gas Lift Valve, call the Otis office nearest you or write Otis, Dept. 3-W, Box 35206, Dallas 35, Texas. You'll find your Otis specialists ready to help you — anxious to serve you.

OTIS

Engineering Corporation

General Offices:

6812 Denton Drive • Dallas, Texas



How to make the best Christmas tree a whole lot better

old trees: Convert your Unibolt Wing Valves to Unibolt Pressurematics by replacing the stem/bonnet assembly with the Pressurematic unit.

new trees: Specify Unibolt Pressurematic Wing Valves. They give you high/low safety plus a shut-off for choke changing.

Here is a valve that does the work of two valves yet costs little, if any, more than a good high pressure valve alone. It operates manually for choke changing, or automatically as a high-low safety valve.

The UNIBOLT PRESSUREMATIC VALVE combines all of the time-tested and proven features of the Unibolt Adjustable Wing Valve with a novel automatic actuating accessory. The valve closes instantly when a predetermined pressure balance across the seat is disturbed. The actuating mechanism consists of a small piston which is exposed to well pressure and a larger piston which is exposed to flowline pressure. A broken flowline or open valve, for example, in the production system, would lower the flowline pressure and thus instantly close the valve. Inversely, a rise in the flowline pressure, for any reason, would cause the valve to close.

Once closed, the valve may be easily opened and set manually for automatic operation.

Send for literature or contact your nearest UNIBOLT sales representative.

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THORNHILL CRAVER CO.

P. O. Box 1184, Houston, Texas

Reagan County, Texas *Ward County, Texas* *Monument Field, New Mexico*

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CF&I-Wickwire salesmen are visiting wire rope users from coast-to-coast, presenting the facts on Double Gray-X, the wire rope that's *guaranteed* to last longer. When he calls he will tell you about:

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CF&I-Wickwire's exclusive *guarantee* makes it possible for you to test our claims about the long life of Double Gray-X without risk. So *if you're interested in lower rope costs ...if you're looking for ways to lower your costly equipment downtime...* get the documented facts on Double Gray-X by sending in this coupon.

The Colorado Fuel and Iron Corporation
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Franks Explorer Has....

COMMON SENSE DESIGN*

***CSD...**

Primarily designed as a servicing and workover rig.

***CSD...**

Mounted on rugged carrier for over the road travel . . . eliminating need for truck which depreciates rapidly.

***CSD...**

Industrial horsepower for more and faster work.

***CSD...**

Greater flexibility . . . masts, drawworks and other components are interchangeable. Your unit is always up-to-date.

More Franks Explorers are sold than any other competing make — pretty good proof that the Franks Explorer **packs more punch!** Ask your Franks Representative for the facts.

WELL SERVICING AND DRILLING UNITS

FRANKS

PAMPA, TEXAS

CABOT

CABOT CORPORATION
MACHINERY DIVISION

Worth more when you BUY 'EM . . . Worth more when you TRADE 'EM

The ROLO emblem

on metering equipment promises you accuracy and dependability

The accuracy and dependability of Rolo metering equipment have been demonstrated in oil fields around the world for years. Rolo, the world pioneer in metering equipment, produces a full line of metering equipment for every field need.

Rolo Oil and Water Meters. Rolo meters have few moving parts and ultrasimple controls. Free gas cannot damage the meter. They have no minimum rate, and the three-position valve used prevents flow of unmetered liquid. Two types of meters are available. Rolocheck® meters, with the accuracy required for royalty payments, are the most consistently accurate production meters available. Economy Line Meters offer Rolo quality in an inexpensive meter, providing necessary accuracy for well-test data.

Rolo Wellcheckers Wellcheckers are skid- or trailer-mounted metering units for testing individual wells. They are used where gas pressure can operate oil-gas separators. These completely piped units automatically separate and meter oil production. Optional equipment includes a gas meter and a built-in free-water knockout to remove and meter free water.

Rolo Metering Separators. Rolo produces numerous metering separators that separate and meter production. These integral units cost less than individual separators and meters. Two-phase metering separators separate oil and gas, and meter the oil. Three-phase units separate oil, free water, and gas, and meter both liquids. (Optional heaters or gas meters are available for both units.)

Rolo Hi-Cap® metering separators handle flow rates up to 50,000 bpd and meter crudes with viscosities higher than 100,000 SSU. These units are available in both vertical and horizontal models.

Rolo Metering Treaters. Rolo metering treaters use a thermostatically-controlled, gas-fired heater and a hay section to break emulsions efficiently. Oil and water are metered in the same vessel.

Rolo Metering Free-Water Knockouts. These units are used where gas pressure is not available. Pressure from the well pump is used to discharge liquids. Units can be mounted on trailers or skids.

Complete specifications on all Rolo metering equipment are given in our Condensed General Catalog. Ask your Rolo representative for a copy, or write to us at the address below.

ROLO MANUFACTURING COMPANY

P. O. BOX 22136, HOUSTON 27, TEXAS • SALES AND SERVICE OFFICES: DENVER, COLO.; ODESSA, TEXAS; NEW ORLEANS AND LAFAYETTE, LA. • CANADA: PETRO-AUTOMATION INDUSTRIES, LTD., EDMONTON, CALGARY AND REGINA EXPORT: R. S. STOKVIS & SONS, NEW YORK, N. Y.

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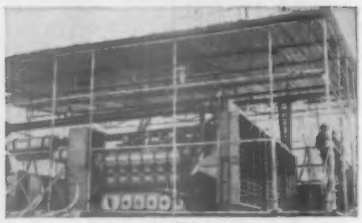
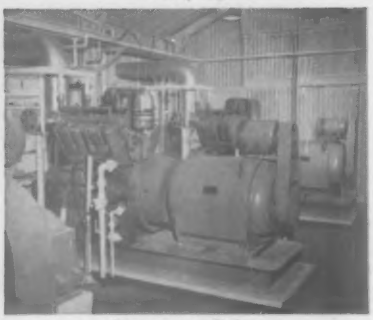
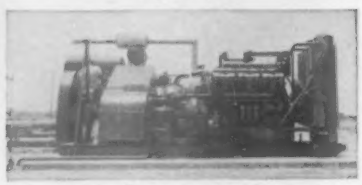


Drilling

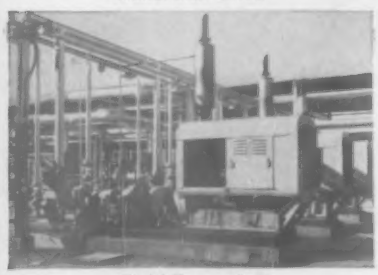


Generator Drive

Pipe Line

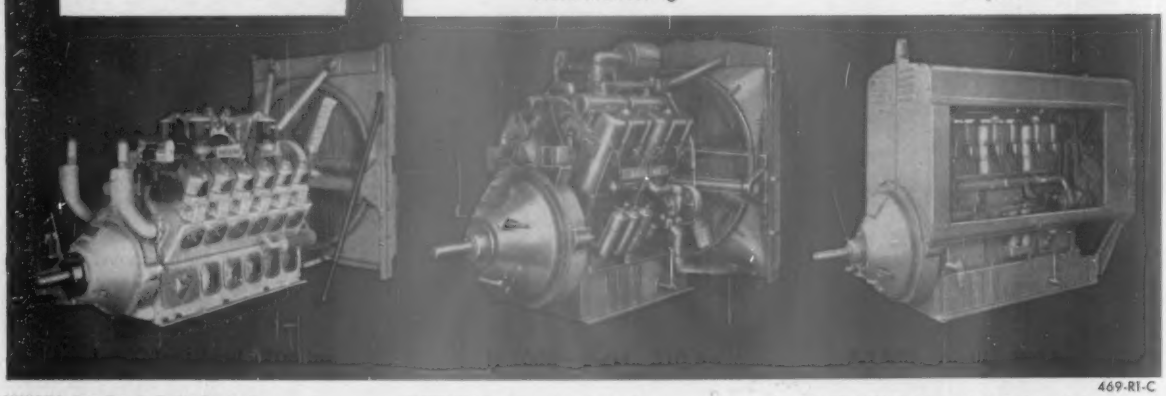


Repressuring



Field Processing

Transport



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FOR NEWS ABOUT THIS OUTSTANDING ADVANCE, TURN PAGE

Introducing the "WHITE LINE"

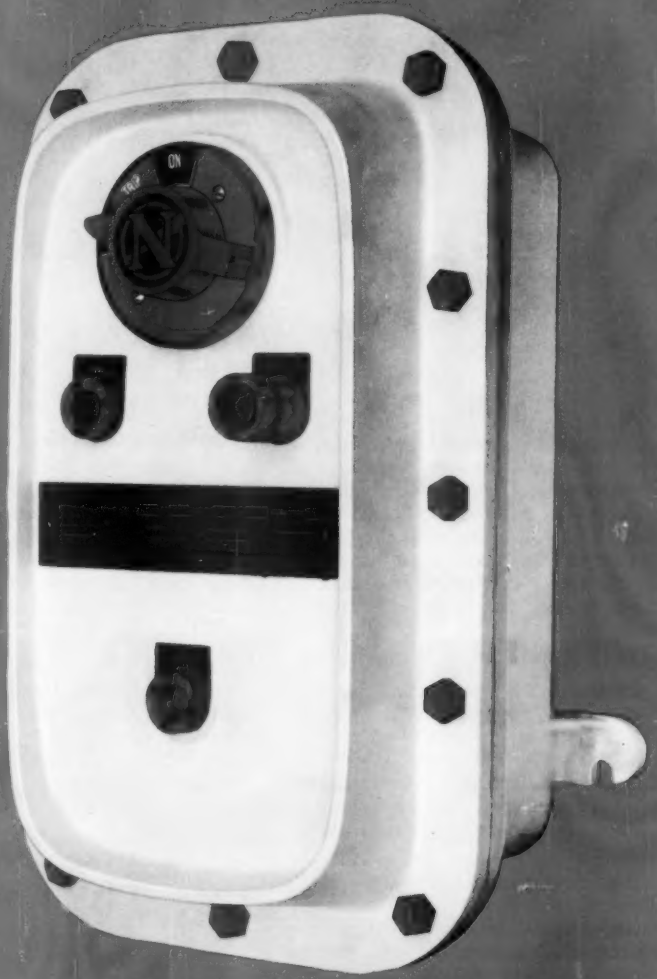
The first ALL-NEW line of special purpose enclosures in 25 years. (NEMA 4, 5, 7 and 9)

NEW COMPACT SIZE

NEW PLUG-IN COMPONENTS

NEW FUNCTIONAL APPEARANCE

NEW QUICK-OPEN COVER



NELSON *Electric* MANUFACTURING CO.
TULSA, OKLAHOMA

P. O. BOX 5365 NATIONAL 7-5530

NELSON ANNOUNCES COMPLETE NEW LINE STARTER & CIRCUIT BREAKER ENCLOSURES

A completely re-designed line of starter and circuit breaker enclosures for hazardous and special purpose applications is now being produced by Nelson Electric Manufacturing Company, Tulsa.

In making the announcement, H. A. Norberg, president of the firm, said "Although we have been an important producer and a leading supplier of electrical equipment for hazardous locations for over twenty years, we have not been satisfied with the approach to such equipment — neither ours nor our competitors.

H. A. Norberg

"To find the solution, we sent our marketing team to customers to discuss their problems. After this research was behind us, we engaged Mr. Wayne Porter — an outstanding industrial designer — who established the basic appearance of our new line.

"When we arrived at what was thought to be the final product, we built prototypes and took them to major users of this kind of equipment — over 100 design and maintenance engineers and purchasing people in the petroleum, petro-chemical, steel, milling and other industries. The men we talked with were most helpful. They spent hours with our marketing people, going over the new equipment. They told us what they liked, and what they disliked.

"After the survey, changes were made to incorporate most of the ideas brought out by interview. Now we have it. We call it the *White Line*. We feel sure it is the shape of things to come in electrical control equipment. And we invite you to become familiar with it at your earliest opportunity."

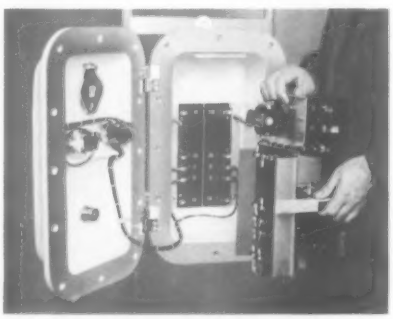
Nelson's new White Line Circuit Breaker includes enclosures for circuit breakers up to 1,000 ampere size. Notice the compact, rectangular design.

ELECTROL PLUG-IN COMBINATION STARTER IS STAR OF WHITE LINE

Prominent among the many advances found in Nelson's *White Line* is a new concept for hazardous area starters— the *Electrol*. These new starters were designed to satisfy modern requirements in today's automated refineries and chemical plants.

The new *Electrol* features complete plug-in components to make change-out a matter of minutes rather than hours. Critical processes are back on the line fast. Line, load and control wiring are all disconnected when the interior is removed. Both starter and circuit breaker, with optional extras such as control transformer, are pan mounted and are removed or inserted without the use of tools. The *Electrol* design — which requires from 23% to 50% less mounting space than competitive makes — includes starters through sizes 4.

For those who desire conventional mounting, non plug-in interiors are available at competitive prices. Sizes 5 and larger are available only in non plug-in design.



Plug-in feature of Electrol combination starter features line, load and control plug-in. Enclosures can be opened, plug-in components removed and replaced, enclosure closed and returned to service within three minutes.

NEW WHITE LINE BY NELSON FEATURES DESIGN CHANGES

One of the most striking changes is the white color of the enclosures. White is the best heat reflective color. This helps keep the interior cooler; in fact, 20° cooler by test — which results in less nuisance tripping and more accurate selection of overload heaters.

The white paint used has a specially selected vinyl base for maximum resistance to corrosion and abrasion. The use of white will eliminate the need of repainting enclosures after installation since the white blends with any color scheme.

The shape of the new *White Line* enclosures is both functional and eye appealing. Fewer flange bolts are required because the enclosure is tailored to the equipment. The bolts are stainless steel, captive type which eliminates lost bolts and fumbling around. In addition, they are the quick-thread type — only one-and-one-half turns are necessary for removal. The raised ridge on the cover is more than decoration; it strengthens the cover and provides a protective recess for hand controls.

Covers on the new *White Line* are hinged to the box, except on the very smallest breakers. This makes servicing simpler and faster since the cover swings out of the way. There is nothing to interfere with complete access to the interior, no heavy pieces to lift and hold in place, and no way to drop the cover on the ground.

Designed to use every major brand of starter and circuit breaker, the *White Line* allows customers to keep spare parts inventory at a minimum, because they may specify the brand on which they have standardized.

Mounting of the new units is simple — due to a new 3-point mounting. This means the enclosure is always solid with no stress when mounted on uneven surfaces. The unit is easier to install, too. After installing the top mounting bolt, the enclosure may be hung on it leaving both hands free to put the remainder of the bolts in place. All *White Line* cast enclosures are available in either iron or aluminum.

In addition to the new starter and circuit breaker enclosures, the *White Line* also includes cast iron and aluminum junction boxes, lighting panels, control stations and power distribution panels.

Confidence, Integrity, and Dependable Facts

THE VISITOR behind the desk at The Oil and Gas Journal in Tulsa is Mr. J. C. Clemmons of the Audit Bureau of Circulations.

TWICE A YEAR the ABC, a nonprofit cooperative association of publishers, advertisers, and advertising agencies, releases a sworn statement giving a detailed breakdown of occupations and locations of Journal subscribers.

AS ONE of the 70 specially trained auditors of the ABC, Mr. Clemmons represents a good deal more than a man with a briefcase who comes to check circulation records of various publications.

TO THE ADVERTISER, he represents the assurance that money invested in advertising is buying a circulation product that measures up to the highest standards. To the ad agency, he is the authority—the source—for dependable circulation data.

ACCURATE information on circulation trends helps a magazine to evaluate editorial policies. The reader's decision to buy a subscription records his judgment of the editorial merit of a publication.

THE JOURNAL, with its 45,863 select, oil-industry subscribers in 97 countries, is proud to bear the emblem of the ABC. For nearly a half century, it has stood as the hallmark of circulation values.

THE OIL AND GAS JOURNAL
211 S. Cheyenne Tulsa, Okla

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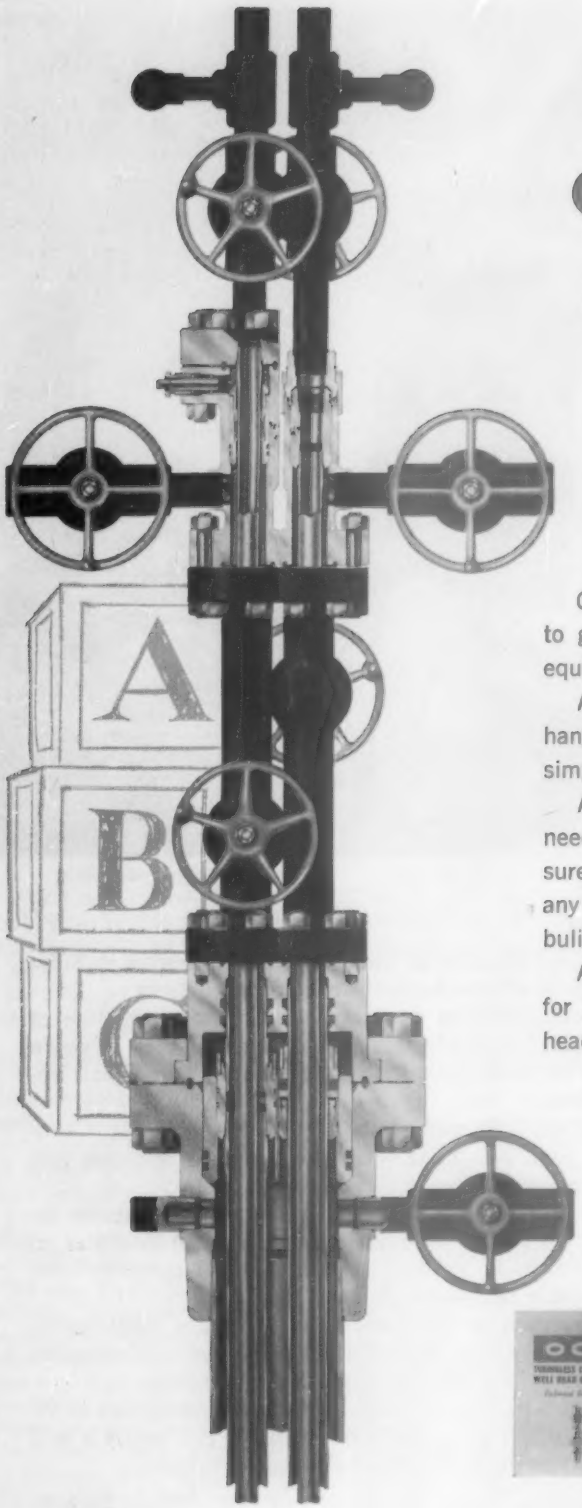

Tubingless Completions are simpler with O·C·T equipment

O·C·T tubingless completion equipment is designed to give you simplicity and flexibility that simplify your equipment problems.

A complete line of interchangeable slip and threaded hangers lets you suspend from one to eight tubing strings, simply by changing hangers.

A variety of casing heads for these hangers meets your needs for single or multiple completions, at working pressures up to 10,000 psi. Master Bushings allow assembling any desired multiple completion and permit running turbulizers, centralizers or other related downhole equipment.

A new type M (for macaroni) tubing head is supplied for hanging 1½-inch and smaller tubing strings. These heads can be furnished with either flanged or threaded connections on top and bottom. Crescent flanges, tri-flanges, and quadri-flanges are available.

If you want to use an economical tubingless completion on your next well, talk with your nearby O·C·T representative. He can show you the latest in tubingless completion equipment.

Write for the helpful free booklet, "O·C·T Tubingless Completion Well Head Equipment," which discusses requirements for tubingless completion equipment.

where progress is a daily practice

O·C·T

OIL CENTER TOOL CO.

SUBSIDIARY OF FMC CORPORATION

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The move to Autocar is
no ordinary experience

This extraordinary experience *usually* starts with some hard-headed figuring about the dollars-and-cents payoff. But the day a truck operator takes possession of his Autocar, emotion takes over. His chest swells. Like the man with a new Browning Grade IV shotgun, or a custom-made fly rod, or a Rolls-Royce car, he knows that now he owns the finest. And he knows the respect his new acquisition will command from others. For Autocar says he has arrived!

Why settle for less when nothing takes the place of owning the "World's Finest." Aren't *you* ready to join the Autocar fraternity?

Autocar
"World's Finest"

Division of
The White Motor Company
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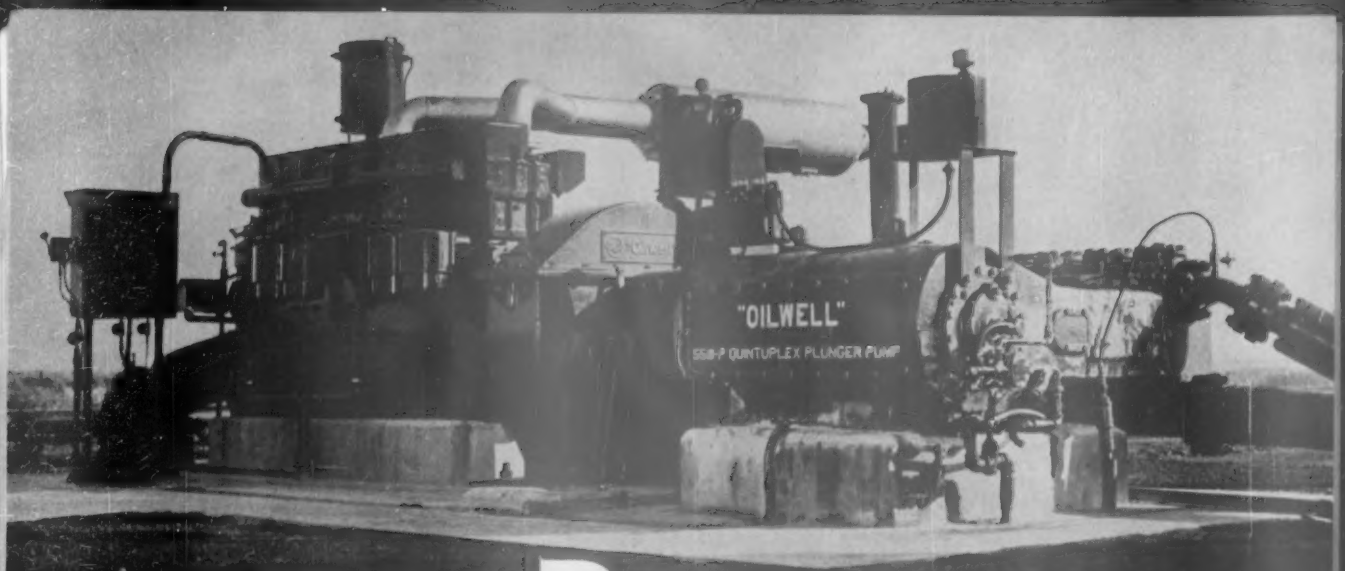


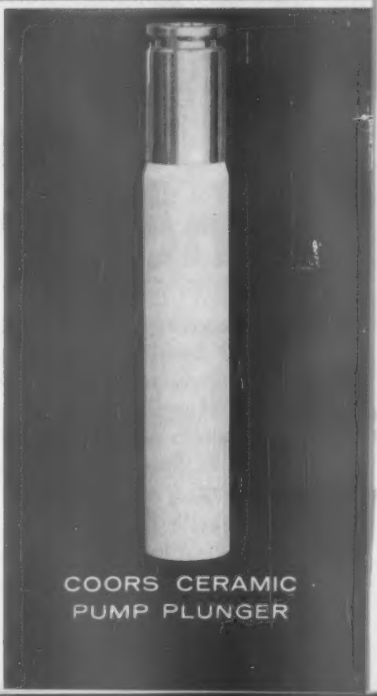
14 "Oilwell" Pumps in one Field have Coors ceramic Plungers

Coors Alumina Ceramic Pump Plungers give you maximum resistance to corrosion and wear. That's why they were selected for use in the fourteen "Oilwell" pumps now on waterflood service in the Sholem-Alechem Field, Fault Block A. The first plungers went into service in 1957 — and still show no wear. Above is the "Oilwell" 558-P Quintuplex Plunger Pump put in service August 1960 — newest of the 14 Coors equipped "Oilwell" pumps. Its five plungers are each 5″ in diameter, with an 8″ stroke. Operating pressure is 1550 psi, pumping 15,000 barrels of salt water per day. For long, trouble-free plunger service, ask your pump manufacturer for Coors Alumina Ceramic Plungers.

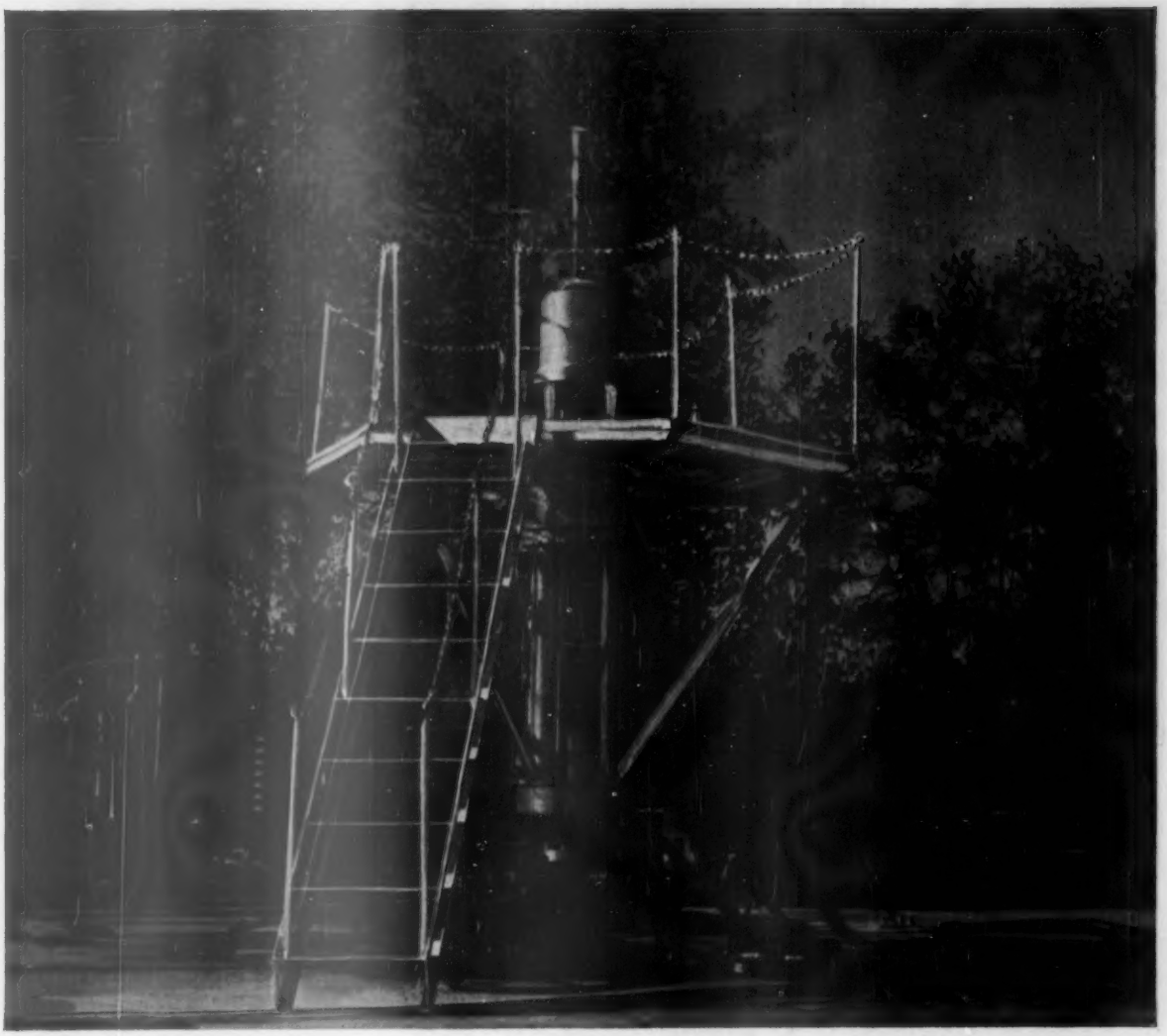
Coors

ALUMINA CERAMICS

Coors Porcelain Co., Golden, Colo.



COORS CERAMIC PUMP PLUNGER



WORKOVERS UNDER PRESSURE

Brown Hydraulic Snubber Workover Units are so compact, easy to rig up, easy to operate and safe that they are kept busy working over wells without killing them. Tubing is pulled and rerun without any danger of damaging the reservoir by fluids such as salt water or mud. Operators save the cost of mud and time required to kill the well and to bring it back in after the workover.

In addition to planned workovers, emergency work such as recovering parted tubing, washing over stuck pipe, washing out sand bridges, fishing jobs and many other operations can be performed smoothly and under complete control with the Brown Hydraulic Snubber Workover Unit. Its compactness and portability are especially valuable at offshore platforms and inaccessible wells. All operations are controlled from the console which may be adjacent to the well or more remote as desired.

Ask for the new brochure on the Brown Hydraulic Snubber Workover Unit.

BOT
BROWN
OIL TOOLS, INC.
8490 KATY ROAD P. O. BOX 19236,
HOUSTON 24, TEXAS

There's a Gates Hose for every job ...quick delivery from local stocks

Wherever hose is used in the oil fields, you find Gates Hose giving outstanding service. Gates makes a hose for every job: rotary and vibrator hose, API Class C with Barney couplings; swivel hose and hydraulic hose, both SAE 100R1 and 100R2; mud pump hose that is virtually collapse-proof; acidizing hose, air hose, water hose, etc.—every type top-quality and in a full range of sizes.

You get fast delivery day or night from local sources.

Oil field supply houses with stocks of Gates Hose are located near you, backed by Gates Service Centers in every major oil-producing area. Your supply house representative is closely backed by a local Gates Fieldman—a factory-trained hose expert. *For quick delivery, day or night, of Gates Hose of any kind, call your nearby Gates-stocked supply house.*

The Gates Rubber Company, Denver, Colorado BP42

Gates Powercord High-Pressure Rotary and Vibrator Hose

- API Class C, 5000 psi test pressure
- Barney coupling is permanently bonded to hose
- Easy to handle, install and relocate —internally balanced to coil easily and to resist twisting under pressure
- Meets the demands of high working pressures and great depths

A Gates Hose for any need is quickly available from your nearby supply house.

Building the future on 50 years of progress

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Gates Oil Field Hose

Why you should specify

AMERICAN IRON

Flash Welded

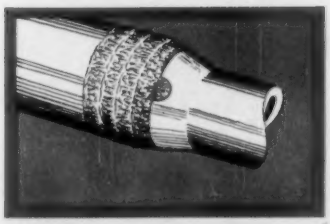
TOOL JOINTS

on your next string of drill pipe!

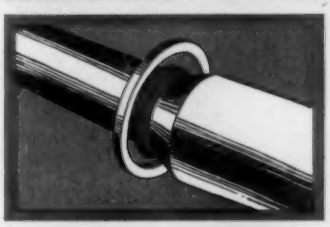
3 Reasons!

Use OPEN-HOLE Tool Joints for your light weight drill pipe

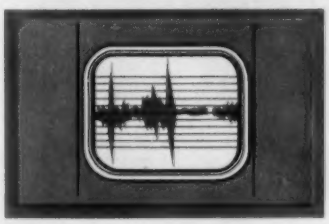
1 HARD METAL BANDS of Tungsten Carbide are available on all American Iron Tool Joints. They are applied PRIOR to heat treatment, which eliminates chipping, rapid wear and does not affect the physical metallurgy of the tool joint.



2 The "WEDDING BAND" is a heat treating process used by American Iron, which more than *doubles* the tensile-impact strength of the Flash Welded connection.



3 The REFLECTOSCOPE is a new electronic testing apparatus used by American Iron for inspecting the weld zone for inclusions and defects. This assures you of maximum performance from your string of Flash Welded Tool Joints!



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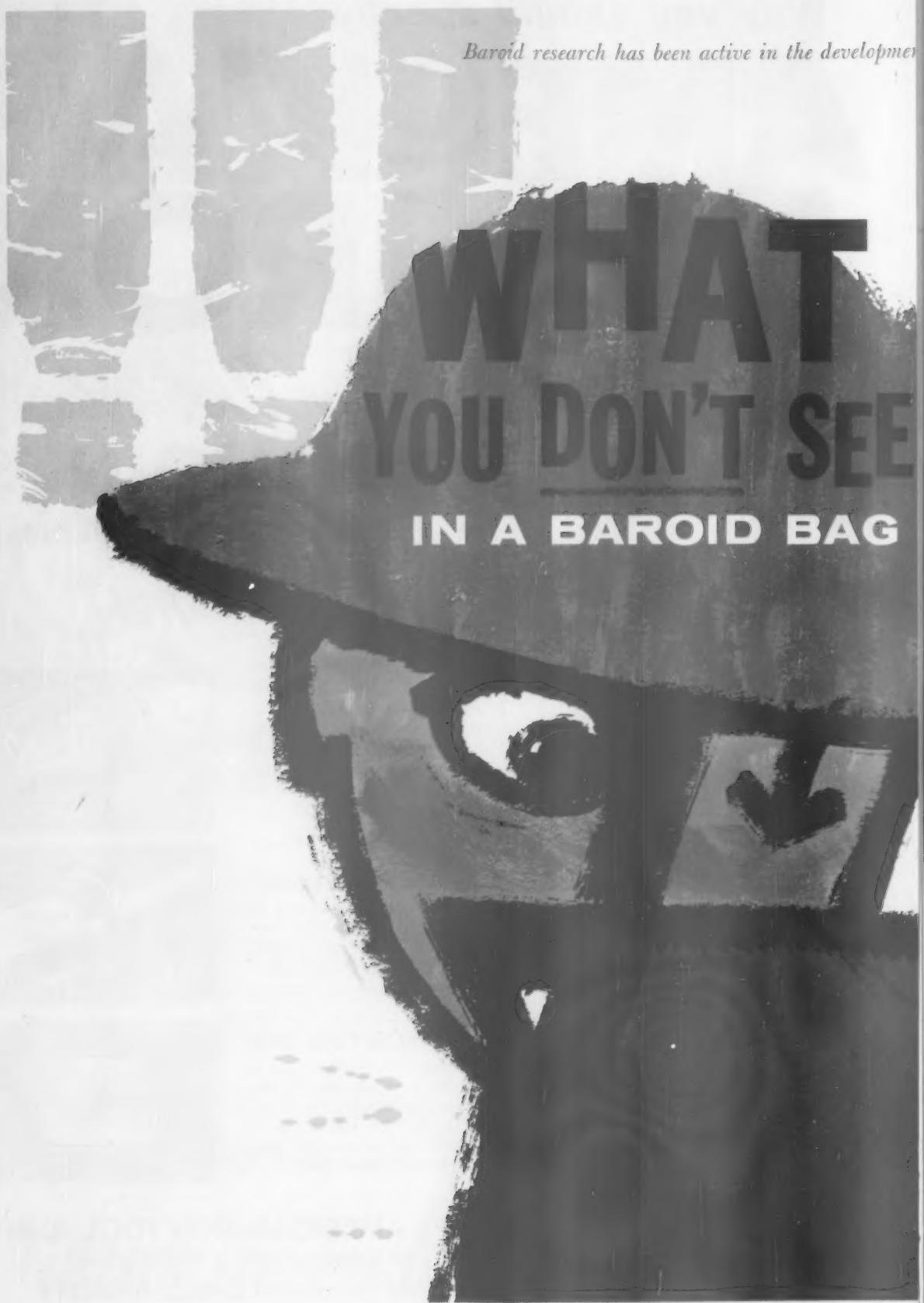
SPECIFY **AMERICAN IRON TOOL JOINTS**
on your next string of drill pipe
for real, economical **DRILL-A-BILITY**

Baroid research has been active in the developme



every major break-through in drilling fluids!

• 8,000 man days of drilling mud research in 1960

• 655 man days of field research in 1960

• 6,000+ man years of field engineering experience

What you *do* see in a Baroid bag is just part of what you get. Behind each product stands technical knowledge gained from over 30 years of field engineering experience. Complete service from mines and plants to the rig makes Baroid the leader in product development and application.

Improved products and services are assured by the most extensive drilling mud research program in existence. New processes and streamlined operations reduce *your* costs.

Baroid has had an active part in the major break-throughs in drilling fluids. Baroid will be on the job when future break-throughs are accomplished!

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6189

They Say—

It's one industry

Dear Sir:

Did you see John Burke's column in the Gasoline Retailer in which he said, in part:

"If the producers are becoming aware of the vital stake they have in a healthy marketing segment of the industry, a large part of the credit is due to The Oil and Gas Journal, which for the past few years has been driving hard on this editorially. In its latest editorial on this the Journal said that oil will become a sick industry if gasoline's 'sorry price condition isn't corrected soon.' "

I, too, feel that you are performing a badly needed service in helping the different branches of the industry better understand one another's problems and their interdependence on one another.

A. J. Rumoshosky, Director
Division of Marketing
American Petroleum Institute

They have problems too

Dear Sir:

Harry Chandler, Steel's copy editor, and I got a big kick out of your "English Spoke Here" column (OGJ, Aug. 28, Journally Speaking, p. 33).

We have our problems, too.

We run data on nonferrous castings from the Non-Ferrous Founders' Society and diecasting figures from the American Die Casting Institute.

It's United Steelworkers of America (USW—not USA in our book), but United Auto Workers (UAW).

And ferroalloys are made by Ohio Ferro Alloys Corp. And we write about gray iron castings, but an advertiser calls them grey iron.

Then if we should write about niobium instead of columbium (it's the same element), we get letters asking if we have switched from the metalworking to the chemical field.

You probably didn't know that Moses Cleaveland was the founder of Cleveland, Ohio, but possibly you know that Houston is "Hewston" in Texas, but "Howston" Street in New York.

Anyhow, I would think Socony

the OIL AND GAS JOURNAL

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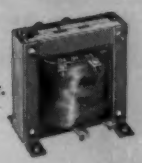
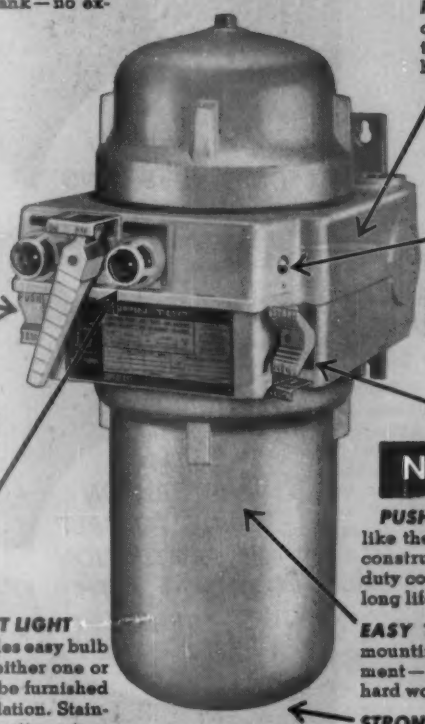
FULL WEATHER PROTECTION - Male threads on collar engage female threads on tank—no external threads to be damaged.

NEW! ***CONTROL TRANSFORMER*** can be mounted in collar. No special-length tanks required.



INCREASED WIRING SPACE - Four conduit openings standard, with through-feed conduit entrances for horizontal tap-offs optional.



NEW! ***SELECTOR SWITCH*** is made in one piece, installs simply by threading into opening provided in enclosure. One-piece construction permits pre-testing before shipment.

NEW! ***RECESSED CONTROL STATIONS*** like the reset button are out of the way, have no protrusion to break or bend accidentally.

NEW! ***PUSHBUTTON,*** like the selector switch, features one-piece construction for easy installation. Heavy-duty contacts and rugged mechanism assure long life.

NEW! ***BRILLIANT PILOT LIGHT*** is visible from all angles and provides easy bulb change. Enclosure available with either one or two factory-mounted lights or can be furnished with plugged holes for field installation. Stainless steel thread-in-thread construction gives corrosion-resistance and easy servicing.

EASY TO INSTALL with *slide and hook* mounting arrangement for interior equipment—a Square D "exclusive." Takes the hard work out of the installation job.

STRONG AND LIGHTWEIGHT construction. Complete enclosure is cast aluminum. All operating shafts are stainless steel, thread-in-thread, for the best in corrosion resistance.

Square D *is Better in So Many Ways!*

When you buy from Square D, you not only get all the benefits shown above—you also are buying from the only manufacturer who builds both the enclosure and the starter, giving you unit responsibility. Moreover, Square D offers better stocks, better on-the-spot service. That's why it makes sense to insist on Square D Spin Top enclosures for your hazardous location applications.

4 ENCLOSURE SIZES ACCOMMODATE NEMA SIZES 0 THROUGH 5

Square D Spin Top enclosures are NEMA 3 (weatherproof), NEMA 4 (watertight), NEMA 7 (explosion-proof) and NEMA 9 (hazardous locations) for Class I, Group C and D; and Class II, Groups E, F and G service.

Write for Bulletin 9990. Square D Company, 4041 North Richards Street, Milwaukee 12, Wisconsin

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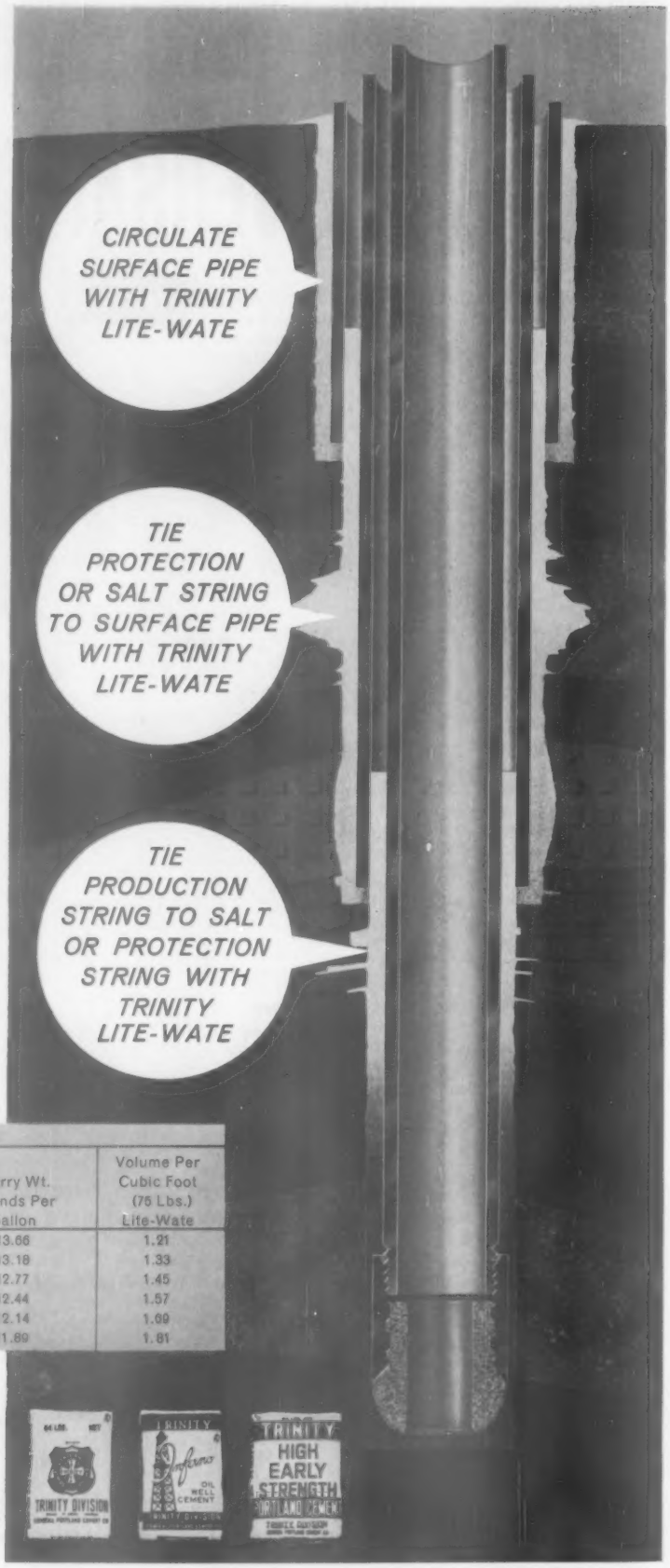
Trinity Lite Wate has been in use for several months in such varying well conditions as found in West Texas, Oklahoma, East Texas, Louisiana, Gulf Offshore and New Mexico,. it has produced returns in *every case* where attempted.

SLURRY PROPERTIES

All slurries were mixed in accordance with procedures in the API RP 10B. Slurry weight and volume were calculated on the basis of Lite-Wate specific gravity of 2.80. Absolute volume 3.22 gallon. Absolute volume cubic foot 0.43.

Mixing Water				
Per cent	Gallons Per Cubic Foot Lite-Wate (Dry Vol. 75 Lbs.)	Initial Viscosity Poises	Slurry Wt. Pounds Per Gallon	Volume Per Cubic Foot (75 Lbs.) Lite-Wate
65	5.85	13	13.66	1.21
75	6.75	6	13.18	1.33
85	7.65	4	12.77	1.45
95	8.55	3	12.44	1.57
105	9.45	2	12.14	1.69
115	10.35	1	11.89	1.81


CIRCULATE SURFACE PIPE WITH TRINITY LITE-WATE
TIE PROTECTION OR SALT STRING TO SURFACE PIPE WITH TRINITY LITE-WATE
TIE PRODUCTION STRING TO SALT OR PROTECTION STRING WITH TRINITY LITE-WATE
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DALLAS·FT.WORTH·HOUSTON

would get more het up by all the Mobile Oil Co. mentions I have seen in the newspapers than a mere misplaced hyphen.

Glenn Dietrich
Associate Copy Editor
Steel.

P. S. Kerosine is spelled with an "i" in our stylebook.

Fractured French

Dear Sir:

This is to report that even out here in the "tools" your Journally Speaking is appreciated, and has been by the writer for many years.

"English Spoke Here" (Aug. 28) reminds me of an occurrence of about 30 years ago at Ponca City. Upon arrival I had noticed a nearby creek identified by a sign on the road "Bois d'Arc Creek." However, a year later, bowing to majority, no doubt, the sign had been replaced with one bearing "Bodock Creek."

Ralph B. Moorhead
Technical Assistant
Sinclair Refining Co.
Sinclair, Wyo.

Situation normal—

"The mandatory import program in effect now for more than 2 years, needs strengthening if domestic producers are to face the future with confidence.

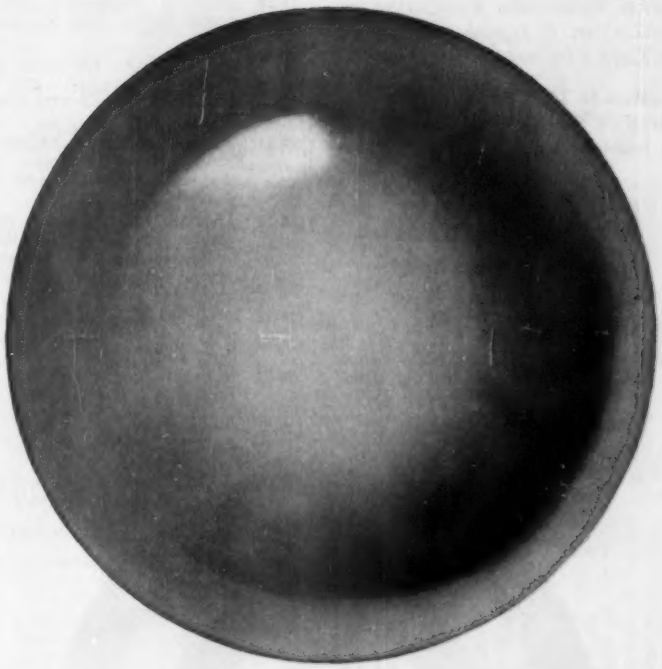
"To be effective, the import program should provide a continuing balance between imports and domestic production, whereby foreign oil would share any increase or decrease in the domestic market.

"Instead, the program has been plagued with exemptions and circumventions with the result that the volume of imports creeps ever upward.

"We have been concerned with the treatment of Canadian and Mexican imports permitted to enter the United States at the expense of domestic production, rather than at the expense of other imports.

"In addition, certain refiners recently were granted larger import quotas on the basis that they had experienced economic difficulties. IPAA has vigorously protested the precedents established in making these adjustments, because it is apparent that virtually any refiner could represent evidence of economic difficulty."

Alvin C. Hope, president, Inde-



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Harbison-Fischer Mfg. Co., Fort Worth

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"BEST PUMPS IN THE OIL PATCH"

pendent Petroleum Association of America, in a speech to IPAA's Salt Lake City regional meeting.

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDAR OF EVENTS

SEPTEMBER

18-19 Independent Natural Gas Association of America, annual meeting, Shamrock Hilton Hotel, Houston.

18-20 Standards Engineers Society, tenth annual meeting Hotel Sherman, Chicago.

20 API, Coalinga-Kettleman chapter, annual barbecue and golf tournament, Polvadero Country Club, Coalinga, Calif.

20-21 National Petroleum Refiners Association, Rocky Mountain regional meeting, Henning Hotel, Casper, Wyo.

20-21 American Institute of Electrical Engineers, Institute of Radio Engineers, Instrument Society of America, industrial electronics symposium, Bradford Hotel, Boston.

20-21 Ohio Petroleum Marketers Association, fall conference, Commodore Perry Hotel, Toledo.

20-22 National Association of Corrosion Engineers, Permian Basin section, annual West Texas corrosion tour, Lincoln Hotel, Odessa, Tex.

21-22 Air Pollution Control Association, east-central section, annual meeting, Sheraton-Seelbach Hotel, Louisville, Ky.

22-23 Association of Desk and Derrick Clubs, tenth annual meeting, Rice Hotel, Houston.

24-27 American Institute of Chemical Engineers, national meeting, Lake Placid Club, Lake Placid, N. Y.

24-27 American Society of Mechanical Engineers, petroleum mechanical engineering conference, Muehlebach Hotel, Kansas City.

25-27 Texas Mid-Continent Oil and Gas Association, annual meeting, Texas Hotel, Fort Worth.

25-28 American Welding Society, fall meeting, Adolphus Hotel, Dallas.

OCTOBER

1-4 American Gas Association, annual convention, Dallas.

3-4 University of Kansas, ninth annual gas measurement institute, National Guard Armory, Liberal, Kans.

4-6 American Association of Oilwell Drilling Contractors, annual meeting, Rice Hotel, Houston.

4-6 American Society of Mechanical Engineers, process-industries conference, Shamrock-Hilton Hotel, Houston.

4-6 American Society of Photogrammetry, semiannual convention and technical exhibit, Biltmore Hotel, New York.

5-7 Southwestern Legal Foundation, American Association of Petroleum Landmen, third national institute for petroleum landmen, Dallas.

6-8 New Mexico Geological Society, annual field conference, geology of the Albuquerque country, registration Oct. 5, University of New Mexico, Albuquerque.

8-11 Society of Petroleum Engineers of AIME, annual fall meeting, Memorial Auditorium, Dallas.

12-13 California Natural Gasoline Association, annual fall meeting, Lafayette Hotel, Long Beach, Calif.

15-17 National Association of Oil Equipment Jobbers, annual convention and trade show, Mayflower Hotel, Washington.

15-18 American Petroleum Credit Association, annual conference, Shamrock-Hilton Hotel, Houston.

17-19 American Society of Mechanical Engineers, American Society of Lubricating Engineers, lubrication conference, Morrison Hotel, Chicago.

18-20 Rocky Mountain Oil and Gas Association, annual conventon, Denver-Hilton Hotel, Denver.

18-21 American Association of Petroleum Geologists, Mid-Continent regional meeting, Amarillo, Tex.

19 West Central Texas Oil and Gas Association, annual meeting, Hotel Windsor, Abilene, Tex.

19-21 National Society of Professional Engineers, fall meeting, Hotel Roanoke, Roanoke, Va.

19-22 Louisiana Gulf Coast Oil Exposition, Lafayette, La.

20 American Institute of Chemical Engineers, South Texas section, annual technical meeting, Moody Civic Center, Galveston, Tex.

24-25 University of Kansas, Southwest Kansas Center, sixth annual natural-gas pipeline institute, Court House, Liberal, Kans.

24-25 Pennsylvania Grade Crude Oil Asso-

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ciation and Pennsylvania State University Mineral Industries Experiment Station, technical conference on oil recovery by solvents, Pennsylvania State University campus, University Park.

24-27 National Association of Corrosion Engineers, south-central region conference and exhibition, Shamrock-Hilton Hotel, Houston.

25-26 National Petroleum Refiners Association, annual question and answer session on refining technology, Rufus Garrett Hotel, El Dorado, Ark.

25-27 Gulf Coast Association of Geological Societies, annual meeting, Granada Hotel, San Antonio, Tex.

27 Natural Gas Processors Association, southern regional meeting, Carlton Hotel, Tyler, Tex.

29-31 Independent Petroleum Association of America, annual meeting, Shamrock-Hilton Hotel, Houston.

29-Nov. 1 National Lubricating Grease Institute, annual meeting, Rice Hotel, Houston.

NOVEMBER

1-3 Southwest Federation of Geological Societies, annual meeting, Hilton Hotel, El Paso, Tex.

2-3 Society of Petroleum Engineers of AIME, annual California regional meeting, Hacienda Motel, Bakersfield, Calif.

2-3 API, annual agriculture-petroleum seminar, Louisiana State University, Baton Rouge.

2-4 Geological Society of America, annual meeting, Cincinnati, Ohio.

5-9 Society of Exploration Geophysicists, international meeting, Denver.

6-8 Chemical Institute of Canada, conference of the chemical engineering division, Royal York Hotel, Toronto.

9-10 Society of Automotive Engineers, national fuels and lubricants meeting, Shamrock-Hilton Hotel, Houston.

13-15 American Petroleum Institute, forty-first annual meeting, Conrad Hilton, Congress and Palmer House hotels, Chicago.

16 Illinois Oil and Gas Association, annual meeting, Mount Vernon, Ill.

17 Natural Gas Processors Association, Panhandle Plains regional meeting, Herring Hotel, Amarillo, Tex.

26-Dec. 1 American Society of Mechanical Engineers, winter annual meeting, Statler-Hilton Hotel, New York City.

DECEMBER

3-6 American Institute of Chemical Engineers, annual meeting, New Yorker Hotel, New York City.

4 AIME's Society of Petroleum Engineers, Arizona section, annual meeting, Pioneer Hotel, Tucson.

4-6 Interstate Oil Compact Commission, annual meeting, Denver Hilton Hotel, Denver.

5-6 National Petroleum Refiners Association, computer conference for refiners, Hotel Tulsa, Tulsa.

JANUARY

7-10 Pipe Line Contractors Association, annual convention, Boca Raton Hotel and Club, Boca Raton, Fla.

8-12 Society of Automotive Engineers, annual meeting, Cobo Hall, Detroit.

16-18 Kentucky Petroleum Marketers Association, annual meeting and convention, Brown Hotel, Louisville, Ky.

19 Natural Gas Processors Association, Gulf Coast regional meeting, Robert

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THOMPSON ROD PUMPS

Solve down-hole pump problems by standardizing on Thompson Rod Pumps—they run longer, more economically. You can count on reliable performance!

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STANDARD:
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1 1/4" 2"
1 1/2" 2 1/2"

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Driscoll Hotel, Corpus Christi, Tex.

FEBRUARY

4-7 American Institute of Chemical Engineers, national meeting, Statler Hotel, Los Angeles.

14-17 Pipe Line Contractors Association of Canada, Castle Harbor Hotel, Bermuda.

15-17 Southwestern Legal Foundation, annual institute on the law of oil, gas, and taxation, Southwestern Legal Center, Dallas.

18-22 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, New York City.

27-Mar. 2 International Oil and Gas Educational Center, institute on economics of the gas industry, Southwestern Legal Center, Dallas.

28-Mar. 2 American Petroleum Institute, Division of Production, southern district meeting, Rice Hotel, Houston.

MARCH

2 Ohio Oil and Gas Association, winter meeting, Deshler Hilton Hotel, Columbus, Ohio.

4-8 American Society of Mechanical Engineers, gas turbine-process industries conference, Shamrock Hilton Hotel, Houston.

16 Natural Gas Processors Association, Oklahoma regional meeting, Sheraton-Oklahoma Hotel, Oklahoma City.

18-22 National Association of Corrosion Engineers, meeting, Municipal Auditorium, Kansas City, Mo.

19-22 Kentucky Petroleum Marketers Association, management institute conducted by the University of Louisville, Brown Hotel, Louisville, Ky.

21-23 New England Gas Association, annual meeting, Statler-Hilton Hotel, Boston.

21-23 American Petroleum Institute, Division of Production, southwestern district meeting, Lincoln Hotel, Odessa, Tex.

26-29 American Association of Petroleum Geologists, Society of Economic Paleontologists and Mineralogists, joint annual meeting, Fairmont Hotel, Civic Auditorium, San Francisco.

APRIL

3 Chemical Institute of Canada, chemical economics division conference, Royal York Hotel, Toronto.

4-6 API, Division of Production, Mid-Continent district meeting, Sheraton Oklahoma Hotel, Oklahoma City.

9-10 Instrument Society of America, national chemical and petroleum instrumentation symposium, Wilmington, Del.

11-12 Petroleum Industry Electrical Association and Petroleum Electric Supply Association, convention and exposition, Dallas.

11-13 API, Division of Production, Rocky Mountain district meeting, Hilton Hotel, Denver.

15-18 American Society of Mechanical Engineers, oil and gas power division conference, Shoreham Hotel, Washington.

17 Society of Plastics Engineers, Philadelphia section, regional technical conference, Sheraton Hotel, Philadelphia.

17-19 Southwestern Gas Measurement Short Course, University of Oklahoma, Norman.

17-19 American Society for Metals, regional conference and exhibition, materials and materials processing for the petroleum, petrochemical and chemical industries, Shamrock Hilton Hotel, Houston.

23-25 American Association of Petroleum Geologists, Rocky Mountain section annual meeting, Salt Lake City.

25-27 Natural Gas Processors Association annual convention, Hilton Hotel, Denver.

29-May 1 Independent Petroleum Association of America, midyear meeting, Hotel Muehlebach, Kansas City.

29-May 2 Liquefied Petroleum Gas Association, annual convention and trade show, Conrad Hilton Hotel, Chicago.

29-May 2 Southern Gas Association, annual meeting, and American Gas Association, transmission conference, Rice Hotel, Houston.

MAY

10-11 API, Division of Production, Pacific Coast district meeting, Biltmore Hotel, Los Angeles.

11 Natural Gas Processors Association, Permian Basin regional meeting, Lincoln Hotel, Odessa, Tex.

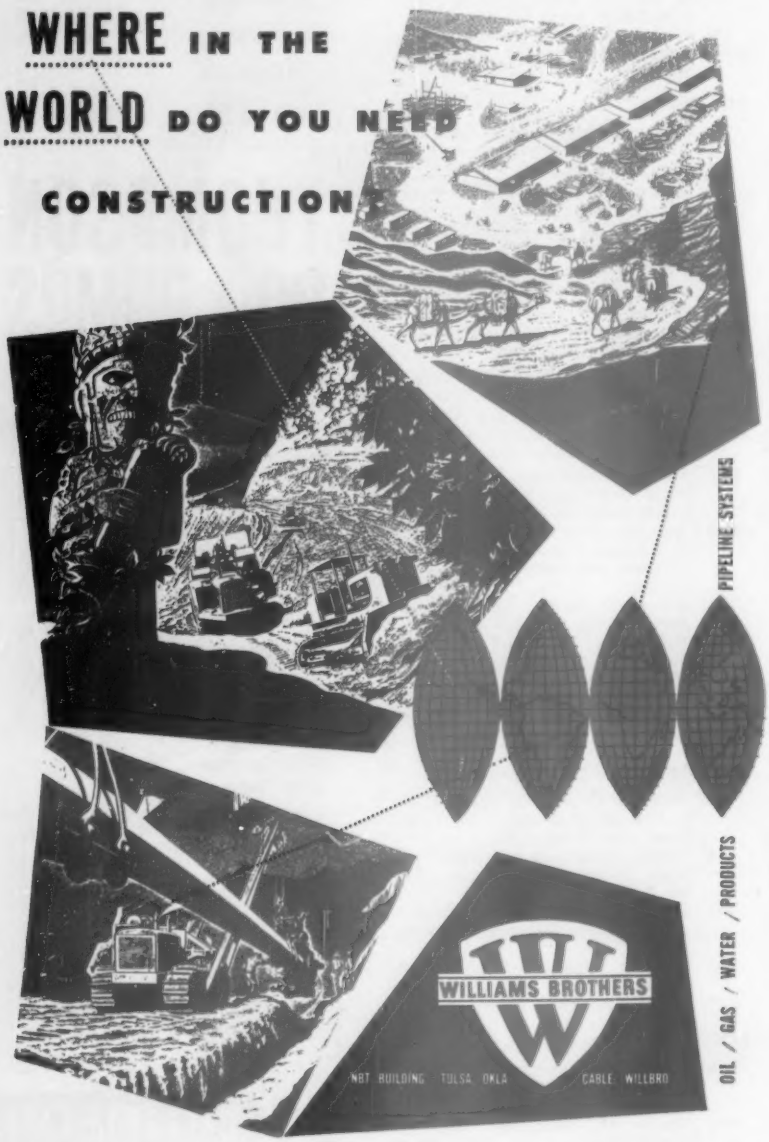
14-17 API, Division of Refining, midyear meeting, Fairmont and Mark Hopkins Hotels, San Francisco.

22-25 API, Division of Marketing, midyear meeting, Queen Elizabeth Hotel, Montreal.

23-25 API, Division of Transportation, annual pipeline conference, Denver Hilton Hotel, Denver.

23-25 Eleventh National Telemetering Conference, Sheraton-Park Hotel, Washington.

24-25 AIME, Rocky Mountain petroleum sections, annual joint meeting, Billings, Mont.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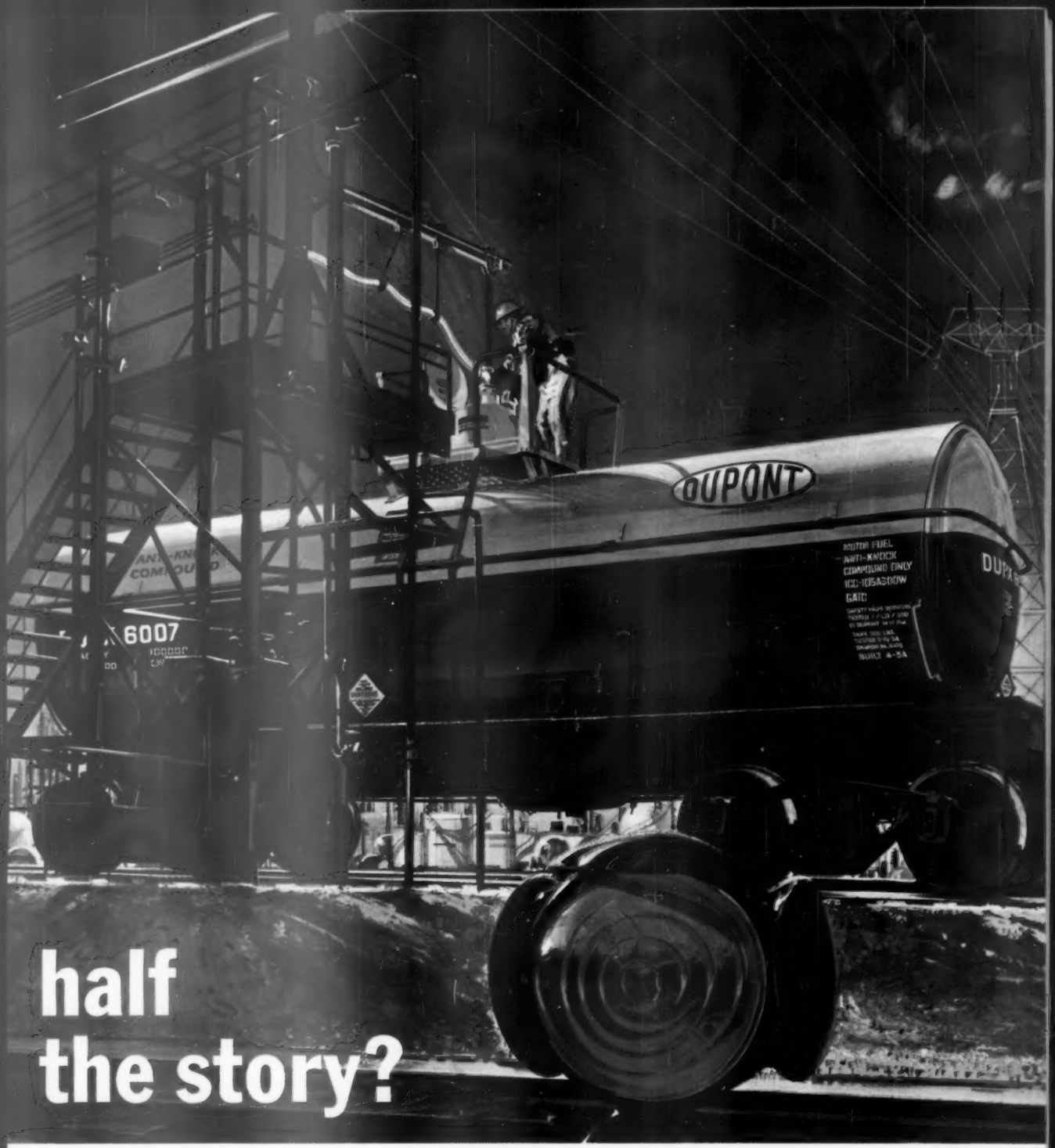

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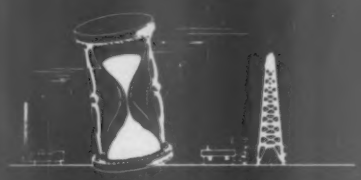

50 years ago

September 21, 1911

The latest developments in the Scottish mineral oil trade indicate a further accentuation of the keen competition which has prevailed in the industry for some time as a result of the world-wide conflict now raging between the principal producers. Burning oils have reached a lower level and are being sold by one of the Scottish companies at 6 cents per gallon, necessitating a corresponding reduction by both domestic and foreign producers.

The London Oil Syndicate reports the discovery of oil on its property about 10 miles from the port of Tunis, in North Africa. Petroliferous sandstone was logged at 171-186 ft. Drilling will continue to 1,000 ft.

25 years ago

September 17, 1936

More geophysical exploration is under way now than at any time since it was started. There are more than 200 crews active with no letup in sight. The industry is spending about 14 million dollars per year on geophysical exploration. It is figured that one or two good fields each year repay the costs many times over. There are few areas on the Gulf Coast which have not been checked with instruments, and most of the district has been reworked.

To speed exploration for oil in Australia, the country's cabinet last week decided to broaden the incentives and set up a schedule of subsidy disbursement to that end. The cabinet decided to disburse up to 50,000 pounds on a basis of one for two spent by individuals in geological surveys. The remainder of the government's 50,000-pound subsidy, established to attract oil exploration, is to be reserved for approved companies engaged in drilling on a pound-for-pound basis.

10 years ago

September 20, 1951

Old Mother Earth has never been punched so full of holes as now when 2,700 rotary rigs are completing an average of 900 wells per week in the U. S. This unprecedented drilling activity is the industry's response to the national need for a reserve producing capacity for petroleum.

Data on 30 oil companies comprising about ⅔ of the industry in the U. S. show increases in demand, production, income, and dividends during the first 6 months of 1951 as compared with the corresponding period of 1950, according to the midyear financial survey prepared by the petroleum department of Chase National Bank. Crude output increased 20.2%, demand for all products was up 12.8%.

JOURNALLY SPEAKING

We ask for it

LIKE TO READ other people's mail? If you're normal, you probably do. Judging from the curiosity generated by readers' letters to the editor, the Journal staff is abnormally normal.

These communications from our favorite people get a lot of mileage around here . . . they're circulated from one desk to another and many wind up in "They Say" so you can look over our shoulder.

We get all kinds. Some tip us off to potential stories. Others point out something we missed reporting on an important development. These are the letters that get action—and fast.

Then there are the letters that tell us we're doing a good job, and to keep it up. Modesty prevents us from printing **too** many of them in "They Say."

Then there's the combo letter. You know . . . "Your article was terrific, but . . ." They may voice an opinion which differs from the one we published. They may nail us down when we make an error.

About those errors. We try our level best to make the Big Yellow Book as factual as possible, but when you print an average of 98 pages of editorial material every week, errors are bound to creep in . . . just every once in a while, mind you.

Here's one that brought in lots of mail. Last year we goofed on a map and somehow moved Minnesota one state east, bordering on Lake Michigan. Most of the razzing we got was good natured, we're happy to say.

Sometimes articles bring in lots of suggestions from readers. Last fall we ran a brief box saying "Line Into Mexico Needs Short Name." This referred to the proposed Texas-Mexico-California gas line backed by TGT, Pemex, Humble, and Southern California Edison.

This project, nicknamed the "Enchilada Line," is still in the prospect stage and as yet has no official name. If it goes through, the backers might look at our letters column of November 14 and 21, 1960, for such suggested names as Tex-Mex, Texical, Texicali, Mex-Tex, Aztec, Azteca, Pemexican, Ten-Mex, and Tex-a-Cal.

Some of our special projects bring in reams of mail. For instance, our 1960 pamphlet "Why Is Gasoline Such a Bargain?" brought in letters all during August and September and, incidentally, set a Journal record for reprint orders—425,000 to date.

Now and then we get an unusual letter such as the one headlined "Attention Stamp Collectors" in the July 10 issue. George Hartley, a Journal subscriber in Abqaiq, Saudi Arabia, thought some of our readers might be interested in some Saudi Arabian stamps showing a gas-oil separation plant. So he sent us two sheets of 100 stamps each.

We ran his letter with an editor's note saying the two sheets would go to the first two readers to request them.

We never saw such a response. At last count we tallied phone calls (local and LD), wires, and letters from 20 states, Canada, France, and Belgium.

Sometimes letters generate other letters. A couple of years ago we carried an article saying that a certain well had set a record for uncased hole. In came a letter naming a better record. And for months they came, until a champ emerged.

We get alternately blessed and blistered for our editorials, too. If we didn't, we'd worry. In fact, we're starting a department in the Journal next month labeled "Opinion" which will probably swell the mail bag. First selection for this feature will be a candid and certainly not candied appraisal of the U. S. oil industry by, of all people, a Briton who pulls no punches.

This is really asking for it.

—*Sara Duncan.*

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WHATEVER THE GRADE, WHATEVER THE VOLUME

WHEN, WHERE and the WAY *you want it!*

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Gasoline tax bucks diminishing returns

THE DISGRACEFUL SALES TAX borne by gasoline has long been denounced by straight-thinking Americans. But to little avail. This insidious growth, a penny at a time, has mounted to the point of abuse of the principle of taxation.

How far can this go? No further, and for a new and compelling reason. Our national and state legislatures have shown little conscience in piling on the greatest tax burden ever carried by any American commodity. Appeals to fairness have been so many whispers in the wind.

Now they must face up to a reality they can understand—the law of diminishing returns.

Here are some facts. Last March the State of Pennsylvania raised its gasoline tax from 5 to 7 cents. With the "temporary" federal tax this amounted to an 11-cent levy on every gallon of gasoline sold in the state.

And what happened? Figures just issued by the state show that gasoline sold in Pennsylvania during the first 7 months of this year fell 36.9 million gallons short of 1960, a 2% decline while the U. S. at large registered a gain of 1%.

This is as clear-cut a case as one could wish. Pennsylvania has come to the end of the line in making gasoline a vehicle for general income. If the rule of reason has never prevailed, now the law of economics will.

THERE'S MUCH MORE to this issue than Pennsylvania's sorry record. Gasoline consumption has almost stagnated in this country, and small wonder. The motorist has countered this raid on his pocketbook by embracing the compact car for one primary reason—better mileage. He'll keep it up until the gasoline tax returns to an equitable level.

But what recourse has the petroleum industry? Austerity, yes. Improved economies through technical advances, of course. But these measures cannot correct the malignant discrimination aimed at its principal product.

There is a lot of loose talk today by individuals who point to the oil business as a "favored" industry from the standpoint of taxation. How dare they deal in such lies when the tax collector figuratively stands at the gasoline pump and exacts as much as the refiner receives for his bread-and-butter item.

WE HAVE NOW COME to the brass-tacks stage of this battle. Government has already jeopardized its income by going too far. This calls not only for a halt in this tax raid. It demands a backing-off from present levels.

Who can say what level gasoline consumption could have reached by now, if unreasonable taxation had not stifled demand as it has. One thing is certain—it would be making better gains than 2% per year. And quite possibly more tax money would be flowing into state and federal coffers.

It is sad to reflect that the law of diminishing returns has entered the picture. But it has, and the point must be punched across with an emphasis that everyone can understand.

correct timing of frac jobs can improve your profits

More than three years of intensive experience in engineering treatments with the aid of the Frac Guide* has given Dowell engineers an intimate knowledge of how various well characteristics influence results from frac jobs. *Correct timing* of fracture treatments is one of the important lessons learned from this study and experience.

While Dowell engineers are not in the business of reservoir engineering, they *can* help you determine what to expect in the way of payout, folds of increase and treatment costs when you fracture your wells.

The production history shown here of a waterflood demonstrates just one of the many situations where timing of a frac job can be vital to profits.

Notice that the frac program on this flood, which began three years after peak rate of production, resulted in an actual gain of 55,000 barrels of oil. The hypothetical curve shows that the net gain might have been 118,000 barrels of oil if the frac program had been performed 18 months earlier. This would have been 63,000 barrels more than the amount actually recovered.

In addition to increasing recovery, the earlier frac program would have hastened payout and reduced total operating costs. The result would have been greatly increased net profits.

If your decline curves and formation energy records indicate that fracture treatments could help, now is the time to ask Dowell to engineer and compute a treatment program. Don't wait too late. Dowell services and products are available in North and South America, Europe, North Africa, and Iran. Dowell, Tulsa 14, Oklahoma.

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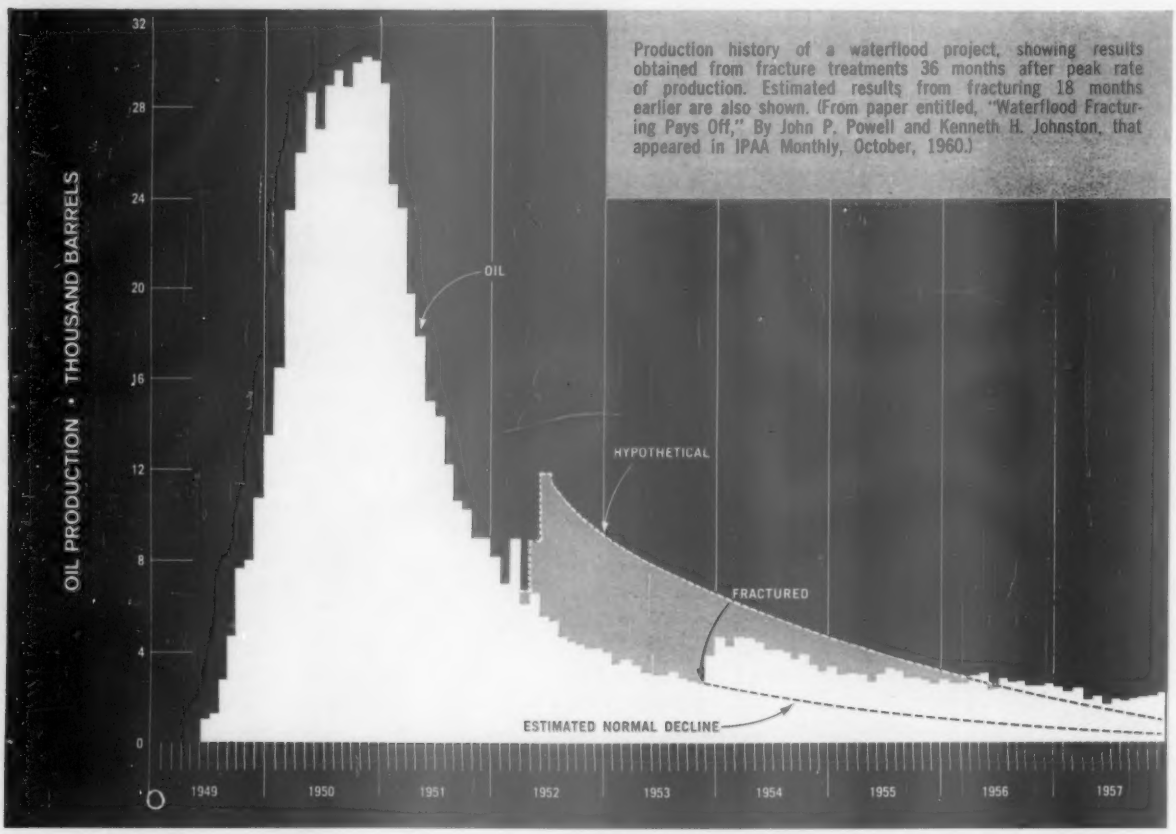
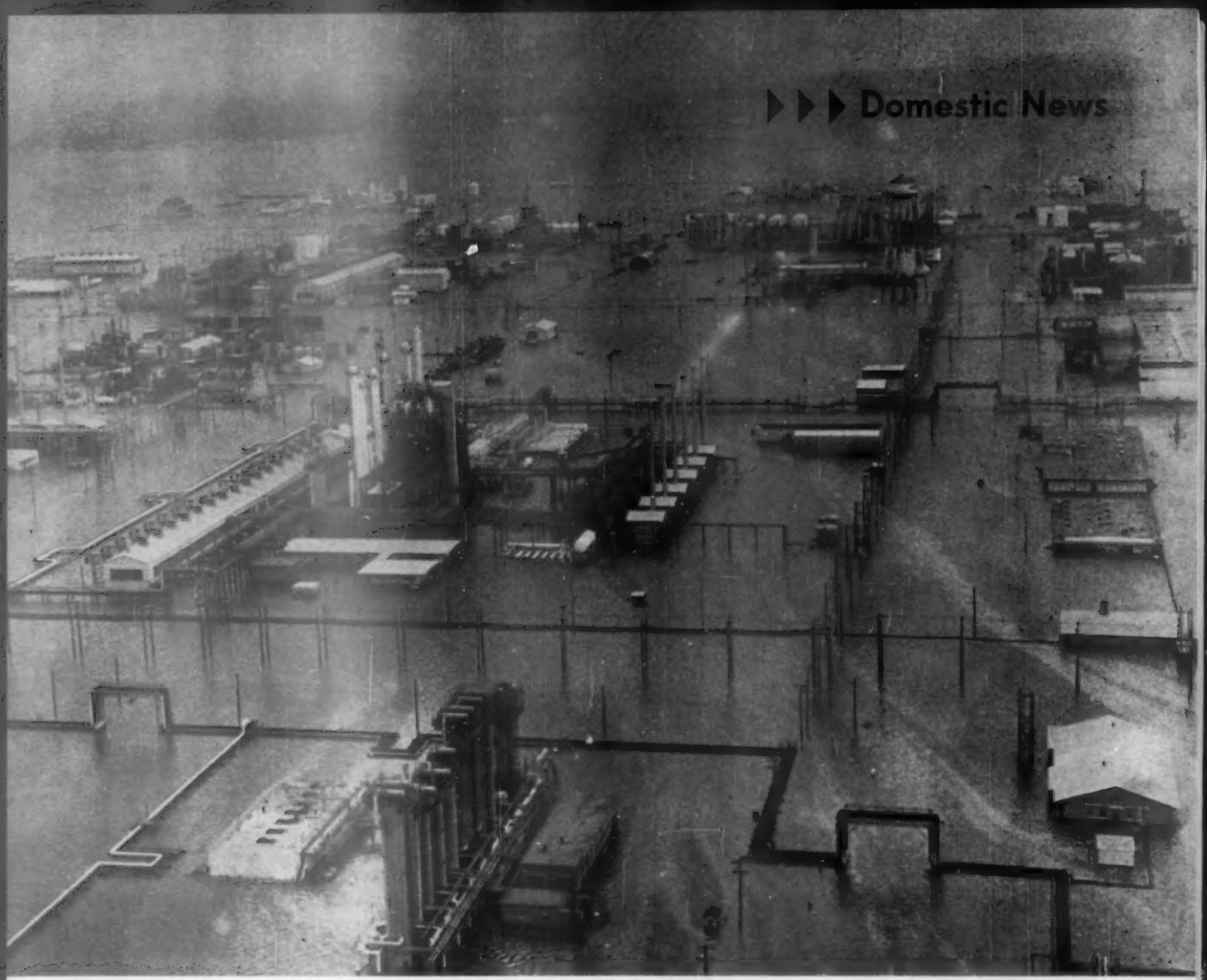


Production history of a waterflood project, showing results obtained from fracture treatments 36 months after peak rate of production. Estimated results from fracturing 18 months earlier are also shown. (From paper entitled, "Waterflood Fracturing Pays Off," By John P. Powell and Kenneth H. Johnston, that appeared in IPAA Monthly, October, 1960.)



WORST DAMAGE along the Gulf Coast was suffered by Dow Chemical Co.'s Freeport, Tex., plant. Sea water flooded part of the plant site to a depth of 14 ft. Company officials estimated loss at $2 million.

The Carla story:

Advance Planning Cut the Toll

THE WINDS, waves, and rains of Hurricane Carla smashed at oil installations from New Orleans to Corpus Christi last week, but the over-all damage was far less than expected.

The Texas City and Freeport refineries and chemical plants suffered the greatest. And the offshore installations in Louisiana and Texas lost at least a million dollars worth of navigational and related equipment.

But no major towers toppled, no platforms sank, no tankers went down, and there were no reports of oil-personnel injuries.

Advance warnings made it possible for oil companies to secure their operations and evacuate personnel well in advance of full force of the hurricane.

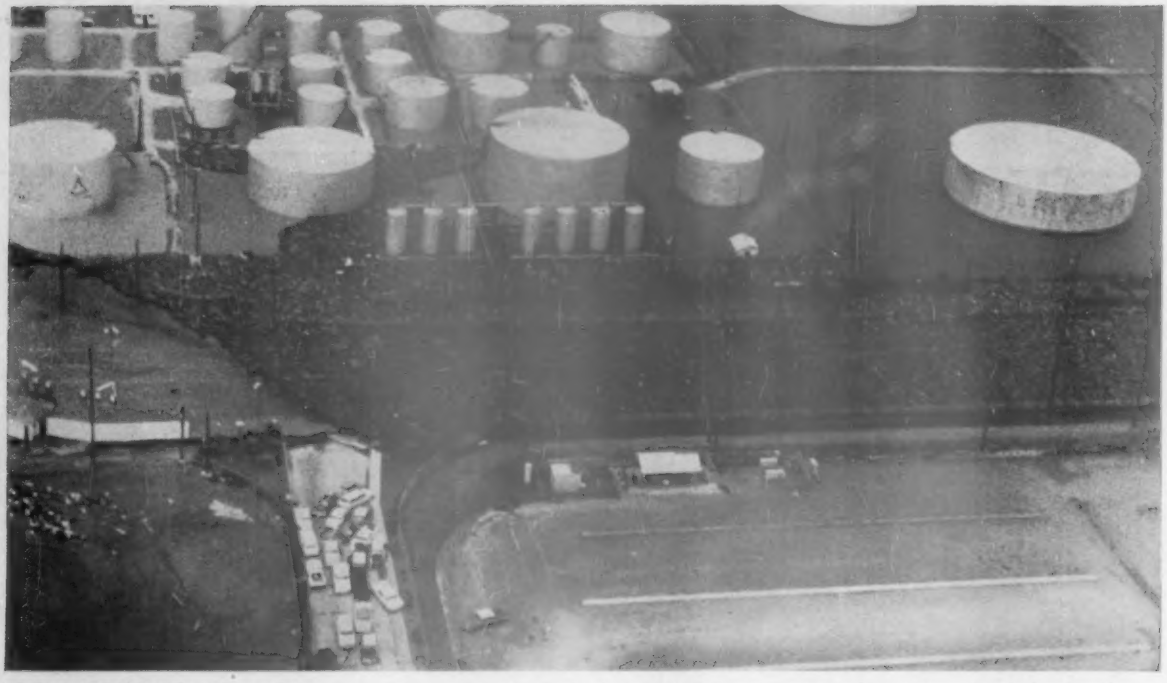
The storm disrupted refinery runs from Port Arthur to Corpus Christi although one Houston refinery—Sinclair—stayed in operation throughout the storm. Virtually all the refineries except for some in hard-hit Texas City were back on stream well before the weekend.

The storm halted all tanker movement along the Texas and Louisiana Gulf Coast for several days.

No ships were damaged seriously during the hurricane, although some broke loose temporarily.

1. Drilling, Production

Offshore drilling and producing operations also were returning to normal. Shell Oil Co.'s Texas offshore wildcat, drilled by Zapata's Vinegarroon 40 miles southeast of Galveston, was making hole again last week after riding out some of



DRUMS ALONG THE GULF. When storm waters started to subside, residents of Texas City found 42-gal. oil drums all over town. Harbur Terminal Co. had more than 600,000 empty drums in storage when Carla struck. Wind and water scattered them all over the area—and part of the Gulf of Mexico. The dark streak in the photo is a "log" jam of thousands of drums blocking a highway and spreading into a tank farm.

the worst winds stirred by Carla.

Standard of Texas' Chevron field, which lies south of Carla's path, suffered damage to boat landings at platforms, but the tank batteries and gas-processing installations on Padre Island stayed intact.

Sunray Mid-Continent's gas-processing plant at Caranchua Bay, located near Carla's eye at one point in her sweep, came through remarkably well, considering the hurricane velocity winds that swept over it. The office blew down, the compressor house was unroofed, and the radio mast was tilted. But the processing equipment was undamaged and crews were preparing to put the plant back on stream.

Offshore losses . . . Penrod Drilling Co. of Dallas spent one anxious day.

After the storm subsided, it found no sign of its $8 million Rig 52, which had been preparing to abandon a wildcat for Placid Oil Co. in 100 ft. of water in Block 198 of the Eugene Island area. A helicopter search Wednesday failed to find anything except the drilling caisson.

Early Thursday the six-legged platform was spotted 50 miles to the northwest in Block 162 of the Vermilion area. It was upright, but the extent of damage was unknown.

Penrod's Rig 50 was damaged on location near the southeast end of Grand Isle. It was below 15,000 ft. on a test for Hunt Trust. The storm broke off the wellhead and left the platform listing badly.

Louisiana Delta Offshore Corp. reported damage of at least $500,000 to its $4.5 million No. 1 rig, a submersible barge which had been drilling in 54 ft. of water in the West Cameron area.

The company said that waves cresting at 92 ft. had covered the equipment, leaving 6 ft. of water in the pump room. Crews were aboard the rig Thursday. The rig had been moved off the hole before the storm.

An underwater-storage unit loaded with crude oil was swept from its location in Block 110 of Eugene Island. The California Co. found the unit more than ½ mile to the northwest, apparently intact and not leaking. The 20,000-bbl. steel unit (OGJ, July 10, p. 114) had 15,000 bbl. of crude and 5,000 bbl. of salt water in it when the storm hit.

Here are reports of some of the other operators in the Gulf Coast:

Continental — No major damage to Conoco or CATC offshore installations. CATC secured its 240-plus wells off Louisiana 2 days ahead of the storm. Six wells were drilling at the time.

Humble — Nine drilling operations offshore and 18 inshore were shut down in Louisiana, and 250 persons were evacuated from the Grand Isle headquarters. In Galveston Bay four drilling rigs and a workover rig were shut down. No major damage. Crews returning to inland water rigs in Louisiana were doing battle with the snakes that had climbed aboard.

Humble Pipe Line Co. lost three crude lines between the mainland at Ingleside and Harbor Island, near Aransas Pass, about 40 miles south of the area where Carla came ashore.

Shell — No major mishap, but there were fairly heavy losses in navigational equipment, such as lights and fog horns. Crews were evacuated by Friday, 2 to 3 days ahead of the heaviest blow, and no platforms tilted or sank. Shell reported that the intracoastal canal remained in operation during most of the storm, and barge traffic continued to move up the Mississippi River. By midweek most offshore installations were either back in operation or almost so.

Gulf — A heliport platform was missing from an offshore installation in the Ship Shoal area. One self-contained drilling platform was found to be listing, and three mobile platforms shifted on location.

In Goose Creek field, eight old production derricks were knocked down.

2. Refining

At least 21 Texas Gulf Coast refineries with more than 2 million barrels daily capacity shut down during Hurricane Carla.

The refineries were closed an average of 3 to 4 days. This downtime, coupled with a slow startup, cost the plants an estimated 10 million barrels in crude runs.

No Louisiana refineries were shut down during the storm.

Here is a city-by-city rundown:

Corpus Christi—Sunside (52,250 bbl. per calendar day), down Sunday, resumed Tuesday, minor damage, some insulation blown off.

Sinclair (29,500), down Sunday, startup depending on restoration of power.

Delhi-Taylor (45,000), down Sunday, resumed Tuesday, full rates by Friday, minor damage, insulation blown off.

Southwestern (33,000), Pontiac (48,000), and Howell (4,750), down Sunday, resuming during week.

Pettus - Danaho (11,400), down Sunday, resumed Tuesday, roof blown off a pump house.

Sweeny—Phillips (95,000), down Saturday, resumed Wednesday; some damage at shipping terminal; no flooding at process units or tank farm; utilities operated throughout storm.

Texas City—American Oil (148,500), down Saturday, resuming late in week. Water 6 to 7 ft. deep damaged pump motors in tank farm; no appreciable wind damage except for insulation blown off.

Plymouth, Republic division (42,750), down Saturday. Startup delayed perhaps several weeks by severe damage from flooding. Insulation blown off towers, telephone and power service out, damage survey in progress.

Texas City refining (34,000), down Saturday, refinery flooded, damage being surveyed.

Baytown—Humble (292,300), down Saturday, resumed Tuesday, only minor damage but considerable cleanup work. Two tankers rode out storm at docks.

Houston—Signal (63,000), down Saturday, resumed Tuesday, minor wind damage.

Sinclair (159,000), remained in operation during storm at slightly reduced rates. Practically no damage except for blown-off insulation.

Crown Central (40,000), down Saturday, surveying damage.

Shell (128,000), down Saturday, resumed Tuesday, some flooding at docks, some fallen power lines, small damage to a water cooling tower.

Beaumont — Mobil (220,000), down Saturday, startup delayed until Neches River water recedes from oil-water separator at the effluent treaters. No damage.

Nederland—Pure (80,000), down Friday, resumed Tuesday, no damage.

Port Neches — Texaco (40,000), down Saturday, resumed Wednesday, no serious damage.

Grove—Atlantic (62,000), down Saturday, did maintenance work after storm, expected to be fully operating by the weekend.

Port Arthur — Gulf (269,040), down Saturday, startup delayed to Thursday or Friday by shortage of fresh water for steam and cooling. No significant damage except for water damage to pump motors.

Texaco (280,000), down Saturday, resumed Wednesday, full production by weekend. No serious damage.

Louisiana—All refineries remained operating, although some reduced rates because of delay in crude shipments from shutdown offshore fields.

3. Petrochemicals

Dow Chemical Co.'s plant at Freeport, Tex., was a major victim of Hurricane Carla (photo p. 57).

Fourteen feet of seawater swept into Plant "A" and 4 ft. into Plant "B" to cause severe damage to instrument controls, motors, electrical relays, control laboratories, and plant offices.

Company officials estimated at $1 million loss in maintenance costs and cleanup, plus another $1 million in unproductive labor costs.

Plant "A" withstood the storm well until a leak occurred in the valves which control the flow of seawater to the Ethyl-Dow plant, and this permitted the seawater to enter.

Wind damage was negligible, although some small tanks were overturned, and some roofing and siding were blown off buildings.

Other plants . . . Most petrochemical plants on the Gulf Coast were shut down Saturday and resumed operations Tuesday. In Louisiana, the plants remained in operation during the hurricane.

Monsanto Chemical's plant at Texas City reported wave damage on the plant levee facing Galveston Bay. The company's new Chocolate Bayou plant site was flooded, but buildings under construction stayed erect.

Gas-liquids plants on the Gulf Coast reported only minor damage, such as loss of insulation and roofing and collapse of some temporary buildings.

Vermont Lawyer Chosen for FPC Post

A VERMONT lawyer is scheduled to be appointed to the Federal Power Commission's one remaining vacancy.

He is Charles Ross, a Republican, now chairman of the Public Service Commission of Vermont. He is 41.

Since there is not enough time left during the current session of Congress for confirmation, Ross will serve on an interim basis until next year.

Ross' regulatory work has been largely with electric utilities. There is nothing in his background to indicate familiarity with gas production.

Acquaintances say he is a middle-roader who puts emphasis on public interest but also recognizes the need for private operation in a suitable economic climate.

Ross will be the fourth man appointed to FPC by President Kennedy. The only holdover member remaining is Jerome Kuykendall, whose term expires next June. And Kuykendall has said he may resign before that time.

West Texas Blowout Creates Major Disaster

A WELL blowout and fire which appears certain to go down as the worst such disaster in oil history, from the standpoint of casualties, was snuffed out for a third time last week.

So far, there are two known dead, three missing. Mobil said 96 were injured. The dead (see p. 172) and missing were working for Parker Drilling Co.

The well which blew is Mobil Oil Co.'s 1 Effie Potts Sibley, a deep wildcat operation 22 miles northwest of Fort Stockton in Pecos County and 1¼ miles northwest of Coyanosa field.

It exploded and caught fire while the operator was attempting to hold a high-pressure gas flow at 9,648 ft.—7 ft. into the Wolfcamp. Blowout preventers reportedly were holding the flow prior to the explosion.

The staggering number of casualties stemmed from the unusual number of workmen on site who were mixing mud. Roughly 125 men had helped mix and pump into the hole a mountain of mud estimated as in excess of 20,000 sacks over a 48-hour period.

Mobil spokesmen say it isn't possible yet to say what set off the explosion. However, reports are that 9-in. casing failed just below the blowout-preventer equipment.

Adair fights blaze . . . The blast—about 11 a. m. September 9—blew the Parker Drilling Co. rig on the project off the hole and onto its side, according to one witness.

Local fire departments from Monahans, Pecos, and Fort Stockton poured chemicals on the fire over the weekend as oil-fire fighter Red Adair rushed to the scene from Houston.

Adair cleared away debris at the site September 12. Hot metal reignited it the first time. It was intentionally fired the second when darkness and accumulating gas stymied capping efforts around midnight September 13.

More metal, however, was cleared from around the well bore in the interim, and it was extinguished again September 14.

Hess Selling Out to Cletrac Corp.

RUGGED individualist Leon Hess is selling out the large integrated oil business he built from a one-truck fuel-oil distributorship.

But he'll still be around to run the $100-million operation with the same strong hand as in the past.

Cletrac Corp., New York, maker of Crawler Tractors and road-building equipment, is negotiating to purchase the interests of the Hess family, sole owners of Hess, Inc., which engages in oil production, transportation, refining, and marketing.

If the transaction is completed, the various oil enterprises will continue to be operated under the Hess name by the same personnel and with Leon Hess, the president, in full charge.

Cletrac proposes to acquire the properties in exchange for 6,177,000 shares of a new issue of common stock. The company's common traded last week at $17 a share on the American stock exchange.

The principal Hess property is a 75,000-bbl. refinery at Perth Amboy, N. J., the only independent plant on the East Coast. Hess conducts many other oil operations.

Liquid Methane Considered for West Coast Use

- Cost of delivering Alaskan gas to California set at 50-55 cents an M.c.f.—if foreign-flag tankers are used.

LIQUEFIED natural gas from Alaska could start moving into the Pacific Coast energy market in a big way within a few years.

A study made for Union Oil Co. and Ohio Oil Co. shows liquefied natural gas (LNG) could be laid down in either Los Angeles or San Francisco from Alaska for 50 to 55 cents an M.c.f. This compares with 42 cents paid in California for some out-of-state gas and a proposed price of 45 cents for gas coming through the projected Texas-through-Mexico line to Los Angeles.

As far as peak-load supply is concerned, liquid methane already is competitive with out-of-state gas in California. And it is only a matter of time until the LNG price is shaved down to where it meets the rising out-of-state gas prices.

This optimistic future for LNG was predicted last week by John R. Fraser, Union Oil's manager of natural gas and gasoline. He was speaking at the Pacific Coast Gas Association meeting in San Diego.

The Union-Ohio price of 50 to 55 cents is based on using foreign-flag ships to move the LNG to California. U. S. maritime regulations prohibit the use of foreign-flag vessels for intercoastal shipments, but if this restriction were waived, LNG would have a bright future in the Pacific Coast.

Fraser points out that if the Pacific Coast were ruled out economically due to the maritime restriction then Australia and Japan are "within striking distance in terms of economic feasibility."

"The technology is proved, the gas reserves are available, and, under the right set of conditions, the delivered West Coast prices of this gas are fully competitive with other available new gas supplies," Fraser says.

Cost breakdown . . . Fraser says the cost of building an Alaska-to-California LNG system would be large, but not "greatly in excess" of the $200 million price tag put on the gas line proposed from Texas to California via Mexico.

LNG has an edge on natural gas for peaking purposes, Fraser said, because handling costs are lower than those of handling natural gas from underground storage.

Fraser says storing LNG also has more flexibility than storing natural gas and the product has the added advantage of being useful in production of liquid oxygen and nitrogen.

Plan developed . . . Union and Ohio have made an extensive study of LNG since their first gas strike on the Kenai Peninsula in 1959. The companies have discovered gas reserves estimated at 3 to 5 trillion cubic feet.

A small portion of the Kenai gas, which is 99.6% pure methane, is piped to Anchorage, but the bulk of the reserve is looking for a market.

Fraser developed a four-step system which would be built if the Alaskan LNG were moved to Los Angeles at the rate of 300 million cubic feet a day. This figure, he says, is the present throughput of the recently completed Transwestern pipeline and "is easily within the capabilities of the available Alaskan reserves." The plan would include:

1. A gathering system to move the gas to a liquefaction plant.

2. A plant which would liquefy the gas and cool it to −260° F. The LNG would be handled at atmospheric pressures in heavily insulated containers. A cubic foot of LNG is equivalent to 630 cubic feet of gas.

3. Special tankers would move the product 2,500 miles to Los Angeles. Economics favor big tankers. Four 60,000 deadweight-ton tankers would deliver yeararound an average of 300 million cubic feet a day.

The LNG could be carried at atmospheric pressure in insulated tanks. Several studies have shown LNG tankers are no more dangerous than a tanker loaded with gasoline or jet fuel, Fraser says.

4. A regasification plant and storage facilities would be built in Los Angeles. The product would either be stored in underground caverns or silo-type aboveground storage. Any storage units near the ocean would use ocean heat to regasify the liquid. Steam heating would be used elsewhere.

The Union official points out all forecasts call for a continued heavy need for out-of-state gas supply in California.

He says a recent study by Stanford Research Institute showed California's demand will reach 8 billion cubic feet daily by 1982. This is 2½ times the present demand. While demand is increasing, the gas produced within California will slip from its present position of supplying one-third of the demand to one-tenth in 1982.

(Related article on Page 81)

Dunnett Takes Oklahoma Oil Post

OKLAHOMA has a new director of oil and gas conservation.

He is Dan R. Dunnett, former senior engineer and assistant director, named to succeed Massena B. Murray, who died September 10.

Dunnett, son of the late Ray M. Dunnett, Tulsa independent oil operator, joined the conservation department in 1946 as a petroleum engineer.

A civil engineering graduate of the University of Oklahoma, Dunnett worked briefly for Phillips Petroleum Co. before joining his father in independent operations in 1940.

Murray was the eldest son of one of Oklahoma's most colorful governors, William H. "Alfalfa Bill" Murray.

Massena Murray in 1931 served as a lieutenant in the Oklahoma National Guard units ordered out to patrol the state's oil fields. The elder Murray had ordered the fields shut in because of drastic drops in crude prices.

When the proration department of the Oklahoma Corporation Commission was created in 1933, Massena joined the staff. He became assistant conservation director in 1947, and director when Walker T. Pound resigned in 1954.

Case Against Wide-Area Gasoline Pricing

. . . American Oil's pricing executive, W. C. Marquis, says such price stabilizing plans aren't working out when they're put to the test.

CONTROVERSIAL wide-area pricing plans have been instituted in a number of markets in recent months. Proponents of the plans have hoped price stability would be the result. But Marquis says this hasn't happened and tells Journal Marketing Editor W. A. Bachman why he thinks the schemes won't work.

Mr. Marquis, before we get engrossed in details of wide-area pricing, would you outline a few fundamentals which several plans have in common?

In the first place, the supplier defines by whatever yardstick he chooses one or more extensive trading areas where he proposes to charge a single prevailing price. The size of such an area may range from a single metropolis with its central suburbs to an area as large as a whole state or even two states.

Then the supplier establishes within each area a single price that he considers to be realistic for that territory. This may be a tank-wagon price figured by discounting from what the supplier considers to be a realistic retail price.

Once the supplier has decided on this price, he maintains it unless changing conditions convince him there should be a revision. If he does revise, he does so throughout the established area. In no circumstance does he grant individual exceptions.

Are there many differences?

Some plans employ a fourth principle—that of feathering-out price differences between two adjoining wide areas. Others do not.

What is the purpose of the plans?

The announced purpose of area pricing is to minimize some of the factors that otherwise might tend to induce or aggravate violent price disturbances.

What is the general assessment of wide-area pricing and how is it working out?

From our point of view, there are indications that it isn't working out nearly as well as its proponents expected. Price wars are just as frequent, violent, and perhaps more widespread than ever before.

Now for some possible problems in workings of area pricing. Has any trouble risen from the boundaries set by a company or its large trading area?

Let us take, for example, a wide area that includes a location that is notoriously known as a dumping ground for distressed gasoline and is consequently subject to frequent price disturbances. Is it fair to include this location with all the others in a wide area and thus open the possibility that this isolated trouble spot will infect markets as far as hundreds of miles away?

Another complication: Although a given wide area may fit one supplier's situation and distribution system, it may not agree with a competitor supplier's idea. How would you meet that competitor's price when only part of your area is affected?

The plans all seek a "realistic price" for the trading area. What are your ideas about realistic pricing? How have the so-called realistic prices worked in wide-area plans?

The problem here is in the definition of "realistic prices." In practice a realistic price in one part of a wide pricing area can be ruinously and unrealistically low in another part of the same wide area. In such a case, wide-area pricing only insures what otherwise might have been a limited price war will spread to a much broader territory.

As for the definition of a realistic price, it is in my book a fair competitive price—one that takes into account the prevailing wholesale markets, competitive transportation costs, and existing local conditions.

Some plans wipe out temporary competitive allowances to jobbers or dealers. Have they actually done so? Would ending them be a healthy trend?

We have noticed that the tendency is to restore allowances under the stress of price wars.

Actually there are different kinds of allowances. We believe in the kind that is granted under an arrangement that takes into account the need for flexibility that permits whatever action seems advisable in a given situation. It involves no fixed protective barrier that gives an individual dealer or jobber an opportunity to cut his own prices and the throat of his competitors without endangering his own operation. The kind of allowance I'm talking about involves nothing more than the supplier's determination not to let his jobbers or his dealers go to the wall in a fight not of their own making.

Are there any other problems faced by those using wide area pricing?

One problem that immediately presents itself is the loss of a vital flexibility. A supplier could be at the mercy of any one-station marketer who decides to move down on his prices, secure in the knowledge that the supplier could not defend himself and his jobbers or dealers without making a wide-area price cut.

Flexibility is necessary for any first-rate marketing operation. The marketer must be able to move quickly to meet any changing conditions. Experience has shown that in the initial stages price cutters can drain business from competitors, especially the major stations. Other marketers have very little choice but to meet the new

price. Often the pricing trouble centers in only a small area—one town usually. But if one marketer prices over a wide area, he immediately extends one town's pricing trouble to others. This is exactly opposite the aim of the wide-area plans, which supposedly are introduced to provide stability.

Your company, American Oil, has not announced a wide-area price plan. Does it intend to?

No.

What is its approach to pricing?

Experience has repeatedly convinced us that there is only one workable way to price and that is in conformity with local economic and competitive conditions as we find them. It may be one town, part of a county, or several counties, depending on local competitive conditions.

If all companies should go to wide-area pricing, would there, in your opinion, still be major pricing problems?

I believe there would. You would still have the problem of overlapping areas because suppliers will differ in their ideas of where an area's boundaries should be. We should also remember that most so-called management action on prices is actually only a reaction and what management is reacting to is the situation at the retail level.

Chaotic pricing appears to be a characteristic of our time. Where do most of the price upheavals start—with supplier, reseller, or dealer?

In my opinion, by far, the greater number of price upheavals start at the local level and they are started there by individual jobbers or dealers, although in some instances suppliers are responsible. I emphasize "individual jobbers or dealers" because, as a group, resellers are not interested in starting price trouble. It takes only one uninformed or inexperienced person, intent on gaining a temporary advantage at any cost, to knock the profits from a market at the expense of all. Of couse, there have been instances where some suppliers have used price as a means of establishing themselves or improving their position in a market.

Do high refinery runs and high product inventories create the climate for price wars?

That most certainly is a large factor. It is for this reason that American Oil makes every effort to adjust its refinery runs to comply with the current market requirements.

How big a factor is the competition for gallonage?

For the answer to that one I can best quote from an editorial of the May 29 issue of The Oil and Gas Journal which said: "Marketers are overly scared at price competition, unreasoningly determined not to lose gallonage even temporarily, unmindful that there is no gain in selling thousands of gallons or even one gallon without a profit."

Many marketers must revise their thinking on this score. The market for gasoline is growing at the relatively small rate of 2 or 3% per year. Yet nearly all of us are shooting for gains higher than that. It generally means that someone will resort to price cutting in the pressure to keep pace. It may mean that marketers in the future must be content with more modest gains in business with more stress on profitable business, better merchandising, better training of local sales people, carefully planned and intelligent, believable advertising.

Does misinformation about competitive prices trigger wars?

There is no question about it. Many a price war would never have begun if only a jobber or dealer or a supplier representative had taken the time to check out thoroughly a report that the competition was cuting price by one method or another. Many another price war would have died as a short-lived skirmish if only a jobber or a dealer had been content to wait 3 or 4 days or even a week before he ran to his supplier for assistance for meeting a flash-in-the-pan cut.

Are there other causes?

Many others, including dumping of distress products in markets that cannot absorb them, and, from

Marquis Knows Pricing

WILLIAM C. MARQUIS, manager of product pricing for American Oil Co., Chicago, has been a close student of oil-industry pricing for many years.

He has directed product pricing activities for the Indiana Standard family of companies since September 1, 1958, and assumed his present position when Indiana Standard, American Oil, and Utah Oil Refining Co. were reorganized early this year.

Marquis is a 21-year veteran with Indiana Standard. A native of Des Moines, Iowa, he joined the company there in 1940 as an agent instructor in the Des Moines regional office.

Wide-Area Pricing Experiments

Here's where major companies have tried area pricing:

- MOBIL in Northeast, Northwest, West Coast, Texas.
- ESSO in North and South Carolina.
- CALIFORNIA STANDARD and TEXACO on West Coast.
- SHELL in Chicago, Detroit, and West Coast.
- OHIO STANDARD in Ohio.
- PHILLIPS in Kansas and Oklahoma.

time to time, the effort by a company to establish itself in a new market by using price as an incentive.

A recent consumer survey states that a majority of motorists doesn't buy gasoline on price. Do you have any experience to support this?

Repeated surveys have shown, and our experience has borne out, that the average motorist can't recall within a cent or so a gallon what he paid for his last purchase of gasoline. However, once the price signs start shouting at him in the midst of a throat-cutting war, he naturally becomes conscious of prices.

Even worse, a price war often too quickly convinces the motorist that price-war losses are fitting and proper. They decide that this is the level at which gasoline should always sell. If the price ever does struggle back to the normal or near it, the motorist figures that he is being gouged.

We had a perfect example of this in Detroit only recently after a prolonged price war. We re-established prices at a point fractionally below what they were before the price war started. The reaction from the public and from politicians was sudden and bitter. There were veiled charges that the so-called increase was a result of collusion and statements calling for state investigation of our pricing practices.

If motorists don't buy on price, how do we explain the rise in popularity in compact cars?

People buy compact cars for many reasons, fuel economy being only one of them. Others might include the need for basic transportation, ease of handling of a compact in traffic, the need for a second car, or the fact that it has become fashionable to have a compact. It is curious to note that in many cases, people who say they want a stripped-down compact for basic transportation decide when they come right down to it that what they really want is a somewhat larger compact car, that it ought to have a little more horsepower, a little more chrome on the outside, fancier upholstery on the inside, and any number of other refinements.

Do motorists buy more gasoline during a price war? Do they buy on price during wars?

No. The demand for gasoline is relatively stable no matter what the price. It is almost impossible for the ordinary motorist to stockpile gasoline; therefore, he buys only what he can use. Naturally during a price war, when his attention is called to price, that will be a consideration when making his purchase.

Has the growth of independent marketers been based mainly on prices?

Certainly, price has been one consideration; but let us not forget that many independents are sharp, aggressive marketers who operate at good locations through attractive facilities and are supported by advertising, credit cards, salaried stations, and other promotional aids.

Is the trend toward a shrinkage of price margins once existing between the majors, independents, and unbranded dealers?

Yes. Spreads between major-retail and independent-selling has shrunk in many markets.

The price differentials in the past have generally increased in direct proportion to the decline in service and facilities of the independent—the greatest price margin being maintained by the operator giving the least service from the smallest facility.

Are such margins justified? Do they contribute to price upsets?

We believe there is a demand for branded and unbranded gasolines. But we don't say that there is any general rule of 1 cent, 2 cents, or 3 cents more. It varies from one locality to another.

Some majors have entered this field with dual-brand marketing. Do you think this is a trend for the future?

I don't know whether you can call it a trend. Some companies are trying it—and we have noted that in some cases the experiment has turned out to be pretty expensive.

What direction do you think petroleum marketing on highways will take—large-type service or speed gasoline stations?

I doubt at this stage if a trend has developed but I know that nearly every company is studying all phases of marketing in search for profitable new approaches.

Marketing scholars have suggested that the ultimate trend for service stations is a general-merchandise center of some sort. Do you share this thinking? Do you have any plans to experiment with this idea?

We are constantly experimenting with new marketing ideas. You are familiar with our station in Vincennes, Ind., where a single centrally-located station in a city of 20,000 replaced nine smaller facilities. Our gasoline volume in the one station in a little over a year is within a fraction of a per cent of the combined gasoline gallonage of all nine previous accounts. Our volume on TBA has been sharply increased, thanks to an intelligent job of merchandising by trained men on the driveway. We have had much the same experience on a smaller scale with annual tests in Fairfield, Iowa, and Mattoon, Ill. These three experiments have checked out so well that we are now about to expand this marketing method, with some significant variations, in other locations, but this doesn't mean that we are going to use the same method at all locations throughout our coast-to-coast area.

As a matter of fact, we are just about to try another experiment in Vincennes, about a mile and a half from the central station. We are going to build a gasoline-only satellite station with no lube bays and no special services of any sort.

Court Holds Up Enforcement of Rig-Height Rule

MOST drilling contractors won at least a temporary reprieve last week from new Federal Aviation Agency rules requiring permits to move or erect a rig standing 150 ft. or higher.

The 5th District Court of Appeals in New Orleans issued a temporary restraining order which prevents enforcing of the rules until the case is heard on its merits.

This will delay any enforcement of the order until after the first of the year at least. According to the court clerk, the middle part of January is the earliest the case can be worked into the court docket.

The stay order applies only to those rigs not operating in the proximity of airports. "Proximity" in this case is a bit vague, because the permissible distance varies in places according to rig height, location, and other factors. But generally, a contractor probably would be safe if 3 miles or more away from an airport.

The restraining order applies only to rigs operated by members of the AAODC and the API, the associations which brought the court action.

More Crude Buyers in East Texas Cut Prices to $3.10

THREE more crude buyers in East Texas field have cut their posted prices for this oil to $3.10 per barrel.

Latest to cut are: Ashland Oil & Refining Co., Premier Oil Refining Co., and Scurlock Oil Co.

This brings between 10,000 and 15,000 bbl. daily more East Texas crude into line at the $3.10 price. Seven other buyers had posted at this level before.

Premier's price cut was 5 cents from its April 1960 posting of $3.15. The other two cut back from $3.25.

The latest cuts make it appear still more certain that the East Texas crude price eventually will shake out at the $3.10 level (OGJ, Sept. 11, p. 86).

Watching WASHINGTON

Clyde La Motte

• Governmental questionnaires: An endless flow of paper . . .

SOME oil firm would be doing the industry a service if it kept a record of the man-hours it spends annually in filling out various governmental forms, reports, and questionnaires.

The result might be shocking, even in Washington circles where countless thousands of federal officials and employes spend their days in devising, processing, or filing this endless flow of forms.

Virtually every company has had the experience of having to pull half a dozen men or more off various company projects to gather the information required by some governmental questionnaire with a hurry-up deadline.

There seems little doubt that this sort of thing is going to increase, rather than decrease—so that the busiest people in any company will be the form completers.

Note a few recent examples:

A House subcommittee headed by Rep. Tom Steed (D.-Okla.) recently sent out an extensive questionnaire covering virtually every segment of the oil and coal industries.

Another subcommittee, this one chairmaned by Rep. James Roosevelt (D.-Calif.), is sending out a voluminous questionnaire covering oil marketing.

The Federal Power Commission is requiring extensive information from major producers involved in the Permian basin area-rate proceeding. And the smaller producers will get one of their own before long.

Those are merely some of the "specials." In addition, there are numerous recurring reports of one sort or another that must be filed from time to time. These include reports to the Oil Import Administration, the Bureau of Mines, the Office of Civil and Defense Mobilization, etc. And of course there is the little item of the income-tax report and the bookkeeping involved in Social Security and other programs.

• New fuels study probably means a new questionnaire . . .

IT MUST be conceded that at times the industry itself can use or benefit from this extensive information gathering. But it is equally true that much of the time a questionnaire goes over ground already covered by a previous paper expedition, or that the information called for is filed away on some departmental shelf and promptly forgotten.

On imports alone, for instance, there must be tons of statistics, reports, and statements already on file in Washington. Yet new ones, such as Steed's keep cropping up.

Last week the Senate passed the resolution pushed by the coal people calling for a fuels-policy study. You may take it for granted that the committee set up to do this study will have as one of its first orders of business the consideration of what sort of questionnaire is needed.

• A company's file becomes a governmental file . . .

YOU WILL note, too, that many of the governmental questionnaires keep pushing deeper and deeper into what used to be considered a company's private file. Thus, what was once regarded as a company's own business becomes everybody's business.

One of these days a company is going to get its back up and refuse to fill out a questionnaire. If so, maybe that will put the spotlight on this time-consuming pastime.

Will This Year's Heating Season Bring a

• Demand is better, sure, but runs are still too high and stocks again are out of line. If the weather turns cold early, we could have a good winter, but if not, what happens to profits is strictly up to management.

THE industry this month says goodbye to a lackluster gasoline season and heads into what it hopes will be a better heating-oil season.

It now looks as if it could be a pretty good one.

Stocks are no worse than last year. Demand is running better. True, there may not be a tanker strike to force a cut in runs and blot up some of the surplus; but the industry, with caution, still could fare pretty well.

It will depend on two things:

... How management dictates the level of refinery runs, controls its high product inventory, and manages crude-oil production.

... The weather. Cold weather early in the season could cover up some management mistakes by perking up sales. But the warmer the weather, the sharper management must be.

The industry really needs a good heating-oil season to make up for the disappointing profits from gasoline. In spite of better gasoline demand this summer, price wars over the country almost ruined the profit picture. Some oldtime marketers are calling this summer's battles the worst in memory.

The broad look . . . As oil's seasonal market switch arrives, here is how the industry stands:

... Demand. Total demand currently is about 4.5% ahead of last year. The July and August demand for gasoline, distillates, and residual, surprisingly, was good.

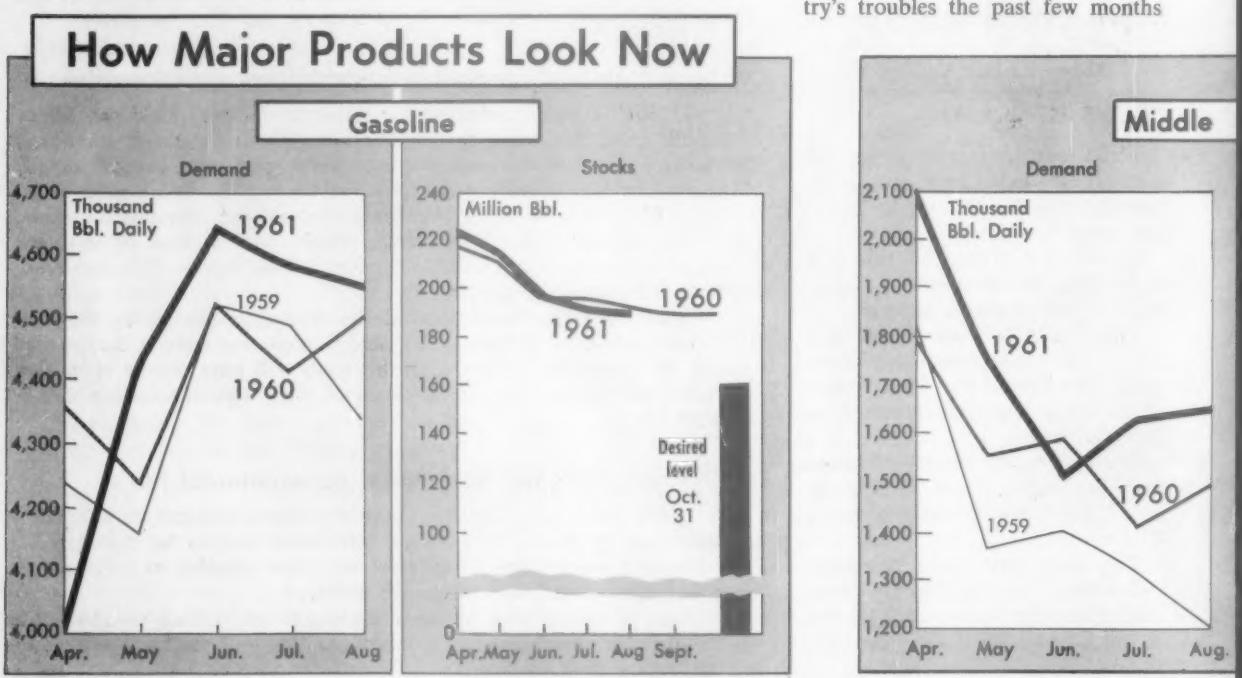
... Stocks. Inventories are running close to last year's levels. Gasoline stocks, however, are sharply higher than the desired level for this time of year. Stocks of middle distillates and residual now are approaching the levels desired for the end of October with nearly 2 months left in which stocks normally will accumulate. LPG stocks are at record highs. Crude supplies are beginning to push the 250-million-barrel mark.

... Prices. Here lies the big disappointment. Gasoline prices are soft with little prospects of much improvement this winter. Heating-oil prices are firm, but whether they move up or down depends on how soon cold weather comes. LPG prices have been soft this summer and also await a winter demand to pick them up. Residual prices are firm with prospects good for improving. Crude prices are under pressure due to poor refinery realizations this summer from gasoline.

... Crude production. Output is running ahead of last year; but any increases in the final quarter are remote, since refiners face the possibility of cutting back runs and since crude supplies above ground already are ample.

... Drilling. Rig activity has hit the year's high point and should remain steady the rest of the year with prospects good that 17,000 wells will be drilled in the last 4 months.

Crazy marketing . . . The oil industry's troubles the past few months



Profit?

have stemmed primarily from marketing and pricing problems at the retail level.

Refinery runs and heavy gasoline stocks haven't helped the situation. But they have not been far enough out of kilter to explain fully the strange didos at the service stations.

Let's consider the supply side of the coin.

Refinery runs reached record highs in late summer and in August exceeded winter-time rates. On September 1, runs still were averaging a record 8,564,000 bbl. daily, up 270,000 bbl. daily over the same period last year.

Refinery production of gasoline increased every month of the summer, and stocks at the end of August stood at 190,280,000 bbl., slightly less than the 190,322,000 bbl. held at the same time in 1960. Only the increased demand prevented an inventory pileup.

The gasoline on hand September 1 represented an estimated 44.3 days' supply. This is less than the 45.2 days' supply on hand last year and is closely comparable to the supply held in each year since 1956.

True, many economists consider 44 days' supply too much to hold at this season when motoring is starting to decline and gasoline stocks will tend to accumulate more rapidly. Nonetheless, the lack of drastic change in supply-demand statistics makes it difficult to blame all the gasoline price woes on refiners.

Now consider the marketing side of the coin.

Wholesale prices of gasoline have had their ups and downs with spot prices periodically feeling the pressure of oversupply. Trends, however, haven't been much different than in other years.

Retail markets, on the other hand, have produced some of the most vicious and prolonged price wars in recent history. Many of them have no relation to the prevailing economics of supply and demand. Prices in many price-war areas have fallen below cost, and in a few areas suppliers have subsidized dealers to handle their products.

Back of the wars are campaigns for greater share of a market where growth has slowed down. Majors are battling for gallonage among

Gasoline Stocks Figured at 44-Day Supply

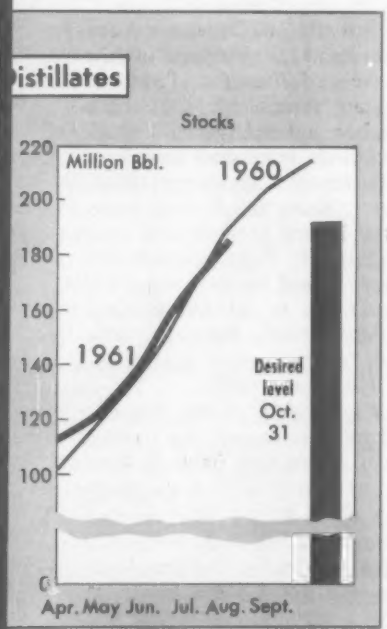
THE industry at the start of September had an estimated 44.3 days' supply of gasoline in storage, slightly less than at the same time last year.

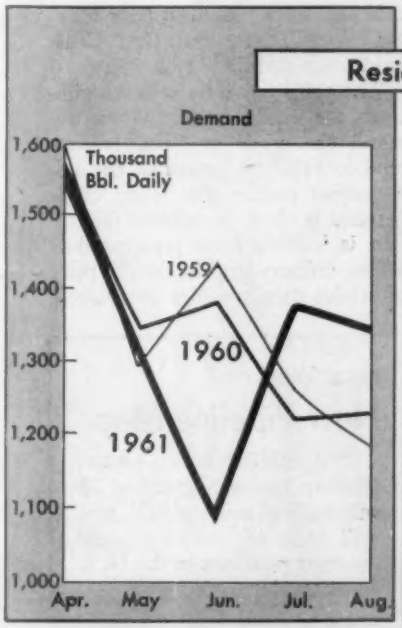
Total gasoline held by suppliers this September is about the same as last year, but an expected increase in demand for September and October reduces the estimated days' supply.

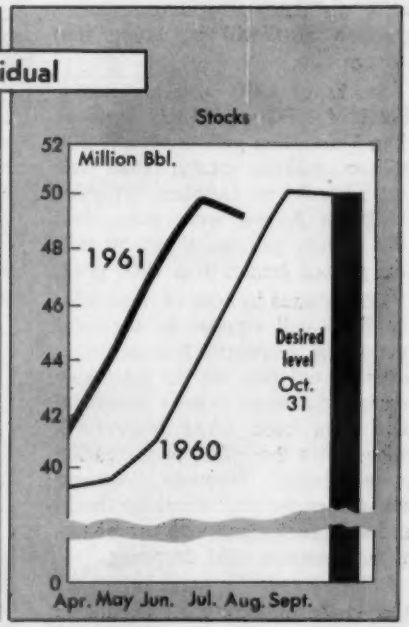
The big question: Does the industry need 44 days' supply at the end of the motoring season? Many economists consider that end-of-season gasoline stocks (see table) have been on the high side for several years.

	Gasoline Stocks Aug. 31	Sept.-Oct. Demand (1,000 b/d)	Days' Supply
1956	172,939	3,889	44.5
1957	174,031	3,918	44.4
1958	177,351	4,142	42.8
1959	181,921	4,175	43.6
1960	190,322	4,213	45.2
1961	190,280	*4,300	44.3

*Forecast.







Runs Drop at Last—But Stocks Don't

REFINERS have cut back runs but gasoline and middle distillate stocks increased sharply just the same.

Crude runs for the week ended September 8—just before Hurricane Carla struck the Gulf Coast—were off by 127,000 bbl. daily from the all-time record of 8,564,000 bbl. set a week earlier.

Largest cut was 45,000-bbl. daily on the Louisiana Gulf Coast. Mid-Continent runs were off 26,000 bbl. daily.

Gasoline stocks increased nearly a million barrels during the week, and middle distillates shot up 6.7 million barrels. The gasoline shift followed a post-Labor Day pattern. (See statistics on p. 176.)

themselves and with independents. Price is the principal weapon. There's little chance for an end to this pricing chaos until the various segments of marketing again accept some rules for doing business.

Winter outlook . . . It will take some help from the weather this winter if refiners are to have a profitable heating-oil season. The best help would be some early cold weather to start volume movements and improve prices.

Refiners still have 2 months to build middle distillate stocks. At the start of September stocks totaled 186,400,000 bbl., only slightly under the desirable level of about 192,000,000 for October 31.

So if early fall continues hot, refiners may be forced into a severe revision of runs to avoid a glut of distillates. They couldn't tolerate too heavy an accumulation because while distillates are piling up more gasoline also will be going into storage.

Stocks of LPG also are heavy. Total of LPG and LRG is more than 1.6 million gallons, nearly 300 million gallons greater than last year's peak in October. Propane stocks in August were more than 940 million gallons, about 50 million gallons greater than 1960 peak.

Price trends in both of these winter fuels will emerge in the next few weeks. Currently fuel-oil prices are reported firm on the wholesale market. Some summer discounts also have been lifted from LPG prices, with the effect of increasing posted prices. However, demand will determine the prices on both, and volume demand won't come until temperatures start dropping.

The crude outlook . . . Producers have been sending more crude to market this year.

Production for the first 9 months totaled 1,748,000,000 bbl., up 34,000,000 bbl. from last year during the same time. Crude stocks also have advanced 9,000,000 in the first 9 months to total 249,000,000 bbl.

Prospects for increases over the present rate of production aren't too good for two reasons:

. . . A cut in runs by refiners may be necessary before long. Runs have been unjustifiably high for late summer. One reason given to justify the high rate: Fear of a maritime strike. With threat of a strike now virtually eliminated, winter demand must pick up quickly or refiners will have to trim operations to avoid serious glut.

. . . Pressure on crude prices already is being felt. Postings for a sizable volume of East Texas crude were cut earlier this month. Some cuts also were posted in New Mexico, West Texas, and Gulf Coast crudes (OGJ, Sept. 11, p. 86).

The price move by refiners indicates the crude trends. When demand for crude is firm, refiners tend to raise the prices of the undervalued crudes. But when crude demand is slack or refinery realization is hurting from poor product prices, refiners tend to cut the price of crudes they consider overvalued.

Next Week:

New Pipeline Map

THE JOURNAL's annual pipeline issue September 25 will include a completely new wall map of crude-oil and products pipelines in the U. S. and Canada.

Chances Good

This is the second of two articles on Fairway field, one of the most promising discoveries of recent years.

Robert J. Enright
Southwest Editor

FAIRWAY FIELD, biggest U. S. oil find since Aneth, has opened up a whole new geological world in East Texas.

And, at the same time, it has upset a basketful of misguided preconceptions.

One of these was that the James section, producing so prolifically at Fairway now (OGJ, Sept. 11, p. 75), would never be an important target for the drill. It was discounted as a home of piddling oil and gas pools.

A second erroneous idea—much broader and more meaningful—was that heavily drilled East Texas would never see a major field producing from a reef.

Fairway, a James reef field, has exploded these myths with a vengeance. In the process, it has caught many persons by surprise.

Evidence of this lies in the conspicious lack so far of any big leasing drive by East Texas basin operators other than right around the field's bounds.

The reason is simple enough. No one knows which way to go.

Never just one . . . Operators, however, do know this: Never in oil history have wildcatters found just one big solitary barrier reef. There have always been other large oil-producing reef pools somewhere near.

West Texas' Canyon reef pools in Scurry, Kent, and Borden counties offer a good example of a typical reef trend. There, giant Kelly-Snyder is joined by such other big Canyon fields as Salt Creek, Cogdell, Fuller, SMS, Reinecke, Von Raeder, Vealmoor and East Vealmoor, Good, and others.

Most geologists in the Fairway area think there should be a similiar chain of James reef fields in East Texas. And many of them are pretty positive about it.

Bruce Fox, district geologist for Atlantic Refining Co. at Tyler, says:

"We look for a series of James reef pools eventually—not just one

for New, Rich Finds in Fairway Area

big barrier reef at Fairway. But the question is—where?"

Fox pretty well sums it up for his colleagues with other companies.

And his question is well put. Other James reef strikes are not apt to come easy.

Deep-well control lacking . . . One of the biggest geological headaches in looking for such strikes: Despite past heavy drilling in this part of the basin, very few wells have punched down as far as the James.

The James, found at about 10,000 ft. at Fairway, lies below the Woodbine (which is as far as most wells in this area of the basin go) and just above the Pettet.

Bob Nance, geologist for Oliver & West, Dallas consultants, points out this great lack of deep-well control.

"It's almost like working in the dark," he says.

"To the north of Fairway, no wells have been drilled this deep until you get to Opelika field in extreme northern Henderson County. A few have been drilled in northern Anderson County south of Fairway in the Boggy Creek and Isaac Lindsay areas — but here, again, not one has been drilled in the southern two-thirds of this county.

"Only two wells," says Nance, "have penetrated the James section in Cherokee County. One or two have been drilled in southern Van Zandt, and a couple more in Smith County. This isn't much to go on."

Geologists for Atlantic, Hunt, and other major acreage holders in the Fairway area back Nance's contention that lack of deep control is their biggest single drawback in the search for East Texas' hidden James reefs.

Heavy faulting . . . There are others, however.

One is faulting—and lots of it.

Fairway is right in the middle of East Texas' big family of interior salt domes.

A theory held in some quarters is that much of the faulting occurred during and was caused by, formation of these salt domes. A recent geological paper, for instance, is devoted to proving that a fault found during excavating operations in Tyler, Tex., was caused by a forming salt dome nearby.

Whether this theory is correct or not, the mere existence of the faulting makes reef searching a treacherous business.

No good method . . . Geologists agree that there is no single good method for locating reefs in East Texas.

Use of surface geology may prove helpful in some cases, they feel, but probably not in most.

"There is little resemblance," Nance says, "between surface features and deep pays in this area.

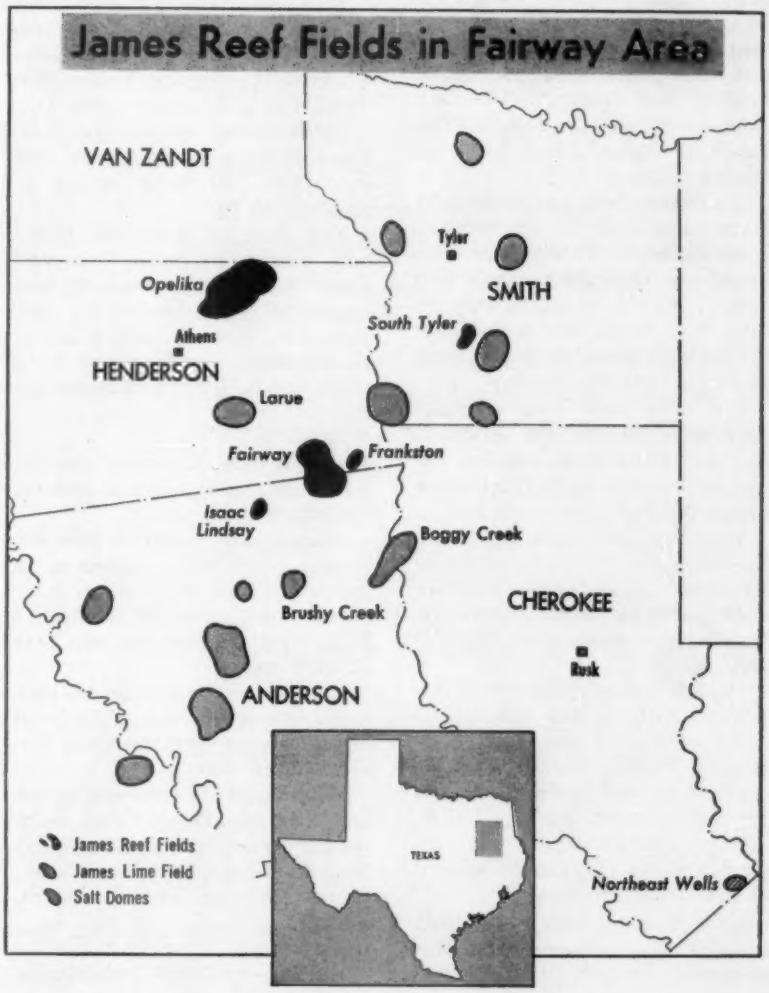
"For instance, a major company recently drilled a well near the Larue dome in Henderson County (a few miles northwest of Fairway). The well was pretty high at the base of the Austin chalk—but it was 1,000 ft. low at the top of the Rodessa."

Seismic work may be helpful in some cases. Or it may be of no help at all.

"This isn't the kind of trend, like the Smackover, that you can plot—at least, not yet—or trace with seismograph," Atlantic's Fox says. "It is just like drilling for strat traps."

Fairway is on a slight high, Fox admits. "But this doesn't mean too much since you can hit reef pay on lows, too."

A district geologist for another major company points out that a



reef oil accumulation can occur in almost any structural or stratigraphic form.

"No one method is going to be the answer in this kind of situation," he says. "The industry doesn't yet have the key. About the only consistency reefs display — and this helps some — is the characteristic thick, porous pay section."

Others heartily agree there is no clear indication of which way to go to look for more productive James reef pools.

The area geologist for a large independent operator calls it "anybody's guess."

As one perplexed explorationist says: "It'll be a moral victory if you just find reefs even if unproductive."

There are guidelines . . . All this makes James - reef - searching look pretty hazardous. And it is.

But there are some guidelines in the form of other James reef fields in the Fairway vicinity. All are unimportant as producers. But their existence and location, combined with other available data, should be helpful.

To date, there have been just five James reef strikes in East Texas, including Fairway.

The first of these was South Tyler field discovered in southwestern Smith County by Phillips Petroleum Co. in July 1944. Phillips 1 McMin flowed 182 bbl. of high-gravity oil daily from James reef at 9,918-29 ft. Five more holes have been drilled since. But only two produced.

The three wells have produced more than 700,000 bbl. of oil so far. And South Tyler remains, except for Fairway, the most important James reef find.

The other three pools are: Multipay Opelika in northeastern Henderson County, Isaac Lindsay in northwestern Anderson County, and Frankston in southeastern Henderson County.

Opelika James reef pay was discovered by Lone Star Gas Co. in April 1949. The discovery, Lone Star's 1 Turner, flowed 2,200,000 cu. ft. of gas and 20 bbl. condensate per million cubic feet at 8,502 ft. The gas flow dissipated early, and the James was plugged off in favor of other, more prolific pays.

Isaac Lindsay also is a small, one-well, gas-condensate field. The discovery, Texaco's 1 Hanks, was completed at 10,094-10,104 ft. for 1,680,000 M.c.f. of gas and 170 bbl. of condensate per thousand cubic feet. It has been shut in since. And the only confirmation attempt was dry.

The latest find was Cities Service Oil Co.'s Frankston field strike in 1955. The company's E-1 White flowed 218 bbl. of oil daily from the James reef at 10,050-64 ft. Two stepouts failed.

Only other Texas production from the James was found at Northeast Wells field in southeastern Cherokee County by Union Producing Co. in November 1958. This is another puny, one-well gas field. The 1 Sessions discovery, now shut in, flowed 330 M.c.f. of gas at 9,415-9,538 ft.

This, however, is not reef. It is a ratty section of dense lime with some fossils, as opposed to true vuggy and highly fossiliferous reef. Geologists, however, feel it not at all impossible that Northeast Wells might not be too far away from a true reef.

Where to look . . . How does all this translate into where to look for more James reef pools?

Fairway-area geologists generally suspect a reef trend will show up eventually from the Fairway-Isaac Lindsay area northwest to Opelika field — and perhaps on into Van Zandt County.

Unproductive James reef has been found in a deep test in Van Zandt drilled generally on this southeast-to-northwest line.

A southeasterly extension of this line runs into Boggy Creek dome on the Anderson-Cherokee county line. Deep tests around this dome found the James lime missing entirely.

This might or might not mean something. It's quite possible, the reef searchers think, that the James—and reefing in it—might reoccur southeast of the dome where there is essentially no deep control.

How about South Tyler field? It obviously doesn't fit into this trend picture. There is speculation that this pool most likely is on an altogether different trend which might go any direction.

The best hunting ground for James reef pools, as geologists see it now, is an area taking in Anderson, Henderson, Van Zandt, Smith, and Cherokee counties.

"If actual reef should be found somewhere around the Northeast Wells area, the James play could get even wilder," one geologist says.

James reef possibilities then probably would be limited on the south by the end of the East Texas basin, and on the east and southeast by the Sabine uplift.

To the above list of counties, could be added portions of Rusk, Nacogdoches, and Angelina.

Farther to the west, the basin shallows out. And reef production, if it existed at all, probably would have been found earlier.

North of Van Zandt, most geologists decline to even hazard a guess. Nearly all wells in this area stopped at the Woodbine. And there are no deep controls at all.

Lease prices climbing . . . This is a big area. And with so little known about reefs in East Texas, it is not surprising that sweeping lease plays have not developed—even considering the size and quality of production at Fairway.

With no good signposts to point the way, reef prospectors are moving cautiously.

Even so, lease prices are climbing. In the immediate vicinity of Fairway itself, where operators have hopes of extending the pool, leases are going for as high as $700 an acre. This compares with a maximum of $200 per acre a year ago.

Farther out—say 7 to 8 miles from Fairway limits—prices have about doubled in the past year, in Anderson and Henderson counties to a maximum of about $35 an acre.

So far, there hasn't been any evidence of large block leasing by majors away from Fairway.

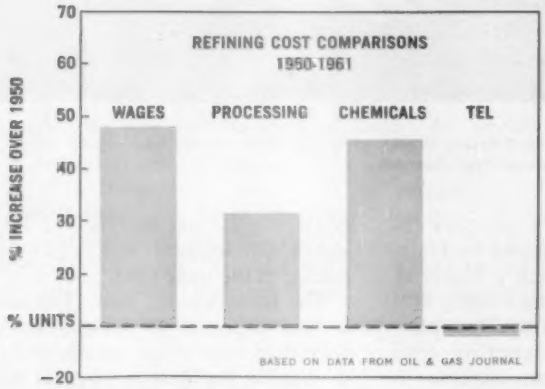
But it's coming. The biggest discovery since Aneth guarantees it.

More Completions

WHEN the first article in this series on Fairway field appeared (OGJ, Sept. 11, p. 75), the total of completions stood at 50. Since then, four more have been added.

As of last week, 11 wells were drilling and six locations were listed in the big field.

Cost effectiveness– just one of six antiknock advantages



Today, more than ever, "Ethyl" antiknock compounds are your best octane-improvement buy—whether you figure cost on Research, Motor or Road ratings.

And also look at these added advantages:

- The range of antiknocks now available permits you to choose the one best suited to your special needs in terms of cost effectiveness.
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Blast Furnaces: Big New Oil Market?

If injection-type furnaces catch on, oil demand will soar.

STEEL MEN of the free world are beating a path to the No. 3 blast furnace at the Hamilton, Ont., plant of Dominion Foundries & Steel, Ltd.

They have come from Germany, England, France, Sweden, and Belgium; from Argentina and Chile; from India and Japan; and from Australia.

Into Dofasco's No. 3 furnace a mixture of iron ore, limestone, and coke is fed at the top, and a great blast of heated air is forced in at the bottom—as in a conventional furnace. Along with the hot air, heavy fuel oil is injected.

And herein lies this installation's uniqueness. The oil serves both as a fuel and a source of hydrogen, and so speeds the reduction of the iron ore into pig iron.

The Hamilton unit marked the first commercial use of oil as a supplementary fuel and source of reducing gas in the preliminary steel-making process. And at more than a dozen other plants in North America and Europe, trials are under way using fuel oil or natural gas.

This development could have great economic significance to two of the world's largest basic industries. It could mean:

...A potential free-world market of more than 100 million barrels of oil (mainly outside the U. S.) and more than 200 billion cubic feet of natural gas (mainly in North America) annually by 1970. These are the estimates of Esso Research & Engineering Co., affiliate of Standard Oil Co. (N. J.), which developed oil injection.

...An annual million-dollar saving in fuel and reducing agents for each blast furnace fired by oil or natural gas.

...Up to 20% increase in pig-iron production for each furnace which uses hydrocarbon injection. This would increase capacity substantially with only a negligible capital outlay—about 0.5% of the furnace cost.

OIL-INJECTION blast furnaces are praised as more efficient than conventional furnaces like this one at Fairless Works of U. S. Steel, which has joined Esso in testing an experimental oil-type furnace.

...A reduction of as much as 30% of the coke required for blast-furnace operation, with a barrel of heavy fuel oil replacing roughly 600 lb. of coke. This would postpone the construction of expensive coke ovens needed for an increase in production.

These are the prospects opened by pioneering developments aimed at reducing the cost of steel making and expanding the markets for petroleum. Coal interests meanwhile are claiming a new technique by which their fuel could do the same job.

Research and development . . . Although the theory of hydrocarbon injection to boost blast-furnace capacity has been known for 75 years, until recently no one had developed a practical injection system.

In searching for potential markets, the New Petroleum Uses Committee of Standard of New Jersey more than 2 years ago singled out blast furnaces because of their voracious energy appetites.

Results of a preliminary study at the Esso Research Center, Linden, N. J., were so encouraging that a crash program was inaugurated. Research, development, and sales were pushed at the same time.

The focus was on heavy fuel oil. It was expected to replace more coke than natural gas would, and it is cheaper than gas in most of the world.

To test a promising injection-system design, Esso joined with the Bureau of Mines and U. S. Steel Corp., using the bureau's 20-ton per day experimental blast furnace at Bruceton, Pa.

Fifteen weeks of experiments beginning in July 1960 proved two important points: The injector nozzles worked under actual iron-making conditions; and oil injection apparently increased pig-iron production substantially.

During this development period a commercial trial was arranged with Dofasco, which was building a third blast furnace at Hamilton. Facing a large capital outlay ultimately for more coke ovens, the steel firm was interested in a process which promised to save sizeable amounts of coke.

In July 1960 an oil-injector nozzle was first installed in an exist-

ing furnace, and then in all 14 air-blast pipes of the new furnace (OGJ, Oct. 24, 1960, p. 72). In tests run during November and December, results came very close to predictions of Esso's furnace computer model.

The payoff . . . The computer predicted that 1 lb. of coke would be replaced for each 0.6 lb. of oil injected.

Actual replacement: Between 0.60 and 0.65 lb.

The steel company was convinced.

It is now conducting a full-scale commercial operation with heavy fuel oil in the No. 3 furnace.

Steel men from a dozen countries have toured the Hamilton plant, the Esso Research Center at Linden, and the experimental furnace at Bruceton. Results of the work have been reported to more than 100 steel companies. More than a dozen in North America and Europe are receiving technical help from Esso for commercial trials with fuel oil or natural gas. (Russia also is reported to be injecting natural gas to increase blast-furnace output.)

Coal challenge . . . Amid the growing acceptance of petroleum injection, "an important breakthrough" in coal injection was announced last month by National Steel Corp., which has perhaps the largest coal holdings among the steel companies.

National Steel, which has been working with Bethlehem Steel Co., makes claims for coal injection that match the demonstrated performances of heavy fuel oil and natural gas. Conceding that more experimental work remains, the company nonetheless claims to have the answer to the competitive threat of natural gas and fuel oil as an alternate blast-furnace fuel.

The original work on coal injection was performed by the Bureau of Mines 2 years ago. The bureau tried without success to obtain continuous operation in an experimental furnace.

National Steel made a similar attempt to inject pulverized coal in a furnace in its works at Buffalo in January of this year. The attempt was repeated June 1, and this time operation was continued for about 2½ months. This is the basis for National's breakthrough claim.

No other steel company is known to accept coal injection as feasible. National has kept its operating data secret. All companies accept natural gas, and most will accept the feasibility of oil injection.

Effect on oil . . . If the National Steel "breakthrough" claim turns out to be premature, as it is widely believed, it will not be the last attempt at coal injection.

Since large supplies of cheap coal are available and most steel companies have big coal interests, they have an incentive to keep working on coal injection.

But, as previous failures have proved, coal injection is not easy. To feed powdered coal into a blast furnace, a system to shoot 15 to 20 equal streams continuously and reliably is needed to avoid shutdowns which would interfere with furnace operation.

Nor is coal injection cheap. A system costs an estimated $500,000 as compared with less than $75,000, plus tankage, for fuel oil.

Even if National's effort, or a later one, makes coal injection feasible, coal will have the advantage over petroleum in parts of the U. S. But the reverse will be true in much of the world. In many countries, coking coal costs more than heavy fuel oil.

Coal success would make a dent in the 100-million-barrel market potential forecast for 1970, and in the natural-gas potential of 200 billion cubic feet.

But regardless of the outcome of coal work, experience thus far indicates a significant new market for petroleum has been opened.

Pipeline Briefs ...

Acquisition of MidSouth Gas Co.'s natural-gas facilities is planned by Arkansas Louisiana Gas. MidSouth's system includes 225 miles of transmission lines and 706 miles of distribution lines which serve customers in eastern Arkansas. In its application to FPC, Arkla proposed issuing 336,000 shares of common stock for distribution to MidSouth stockholders.

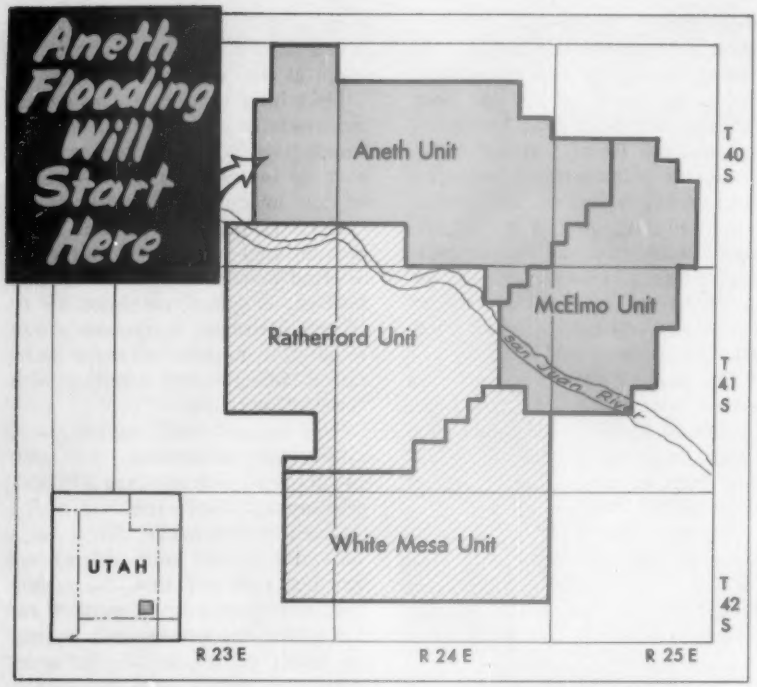
Underground natural-gas storage facilities will be built by Iroquois Gas Corp. in Perrysburg field in Cattaraugas and Chautauqua counties, New York. FPC has approved the $1,812,000 project. When completed in 1963, the reservoir will hold 5.3 billion cubic feet of gas. Iroquois also will lay 2 miles of 16-in. line connecting two existing mains supplying Buffalo, N. Y.

Compressor facilities to increase pipeline capacity by 100 million cubic feet daily are planned by Tennessee Gas Transmission. FPC has given temporary approval for the project, which includes 18,300 additional hp. for the firm's Delta, La., to Portland, Tenn., line in substitution for 157 miles of loops paralleling sections of Tennessee's Kinder, La., to Portland line. The loops, authorized in 1959 but never built, would have provided nearly the same capacity increase.

Expansion of Natural Gas Pipe Line's Texas-to-Chicago system is under way. Panama-Williams Corp. is laying 133 miles in Texas, Williams Brothers has 78 miles in Arkansas, and R. H. Fulton & Co. 46 miles in Illinois. The 26-in. and 30-in. loops parallel existing lines. Total cost, including 5,800 hp. in compressor-station capacity, is estimated at $28.5 million.

Pipe laying has been started by Houston Contracting Co. on 70 miles of 30-in. and 26-in. loops for Texas Gas Transmission Corp. from the vicinity of Memphis to the Lafayette, La., area. Houston has also started work on 52 miles of 20-in., 16-in., and 8-in. line for Texas Gas Transmission Corp. from the Bay Round district to the vicinity of Morgan City, La.

Complete automation of the 930-mile 14-station system of Mid-Valley Pipeline Co. from Longview, Tex., to Lima, Ohio, will be undertaken by North Electric Co. The 20-in. and 22-in. system has a capacity of more than 200,000 bbl. per day. The 14 dual-fuel and electric power stations will be automatically controlled from Longview.



Injections Set for December

. . . in more than half of southeast Utah's Aneth field.

A third unit may be approved later this year.

THREE months from now, water will start down injection wells in Utah's Aneth field to begin what may become the world's biggest water flood from an acreage standpoint.

Two water-flood projects covering more than half of the entire Greater Aneth area already have been approved. Two more, covering the remainder, are now in negotiation.

When all four units are operating, the flood will cover 64,500 acres and 520 wells. SACROC in the Kelly-Snyder field of Scurry County, Texas, at present is the largest in area with 53,000 acres under flood. Biggest in volume will be Wilmington field of California, where injections eventually will reach 1,000,000 bbl. daily.

Secondary recovery in the entire Greater Aneth area is expected to double the anticipated primary production of 160,000,000 bbl. which is 18 to 20% of oil in place. Engineers expect economical water-flood recovery for the next 25 years.

First injection will be made in December by Texaco, as operator of the Aneth unit. The second approved project is for McElmo Creek unit, with Superior Oil Co. as operator.

Final agreements for those two units came after more than 2 years of negotiations with owners, operators, and government agencies. The water flood was authorized by the Department of Interior, Navajo Indian Tribal Council, and the Utah Oil & Gas Commission.

Unitization of White Mesa is expected to be completed this year. Negotiations on the Ratherford unit are proceeding slowly.

Aneth unit . . . The Aneth unit's 212 wells, draining 23,750 acres, have produced 33,000,000 bbl. of oil since the field's discovery 5½ years ago.

During secondary recovery operations, 51 injection wells—most of them converted producers—will pump 80,000 bbl. of water daily into the Desert Creek zone at 5,600 ft. Forty-two miles of 8-in. and 3-in. distribution lines and 4½ miles of 16-in. water lines will be laid.

Most of the Aneth unit flooding will be on a peripheral pattern. This will be modified in the southern part, where a 5-spot pattern on 160-acres is being considered.

Water will be taken from the San Juan River, although operators expect to drill 20-ft. to 50-ft. wells into gravel beds along the stream to bolster the supply.

Major participants in the Aneth unit, other than Texaco, are Gulf, Shell, Humble, Cities Service, Pure, Petroleum Atlas, Sun, Delhi-Taylor, Ohio, Aztec Oil & Gas, and Southern Union Gas.

Other units . . . Principal owners of McElmo Creek are Superior, Humble, Phillips, Texaco, and Continental. McElmo has 100 wells on 19,500 acres that have produced 28,000,000 bbl.

White Mesa unit, incorporating 5,750 acres, will be operated by Continental. Other owners are Phillips, Superior, Texaco, Pure, and Humble.

Phillips will operate Ratherford unit, which involves about 110 wells on 15,500 acres. Other major owners are Shell, Superior, Texaco, Standard of California, and Aztec.

Industrial Sales Account for Most of Lube-Market Growth

SALES of automotive lubricating oil last year rose less than 1% above 1958, when the most recent prior survey was conducted.

But thanks to improvement in sales of industrial lube oil, the total volume of lube oils and greases rose 5.4% in the 2-year period, according to a survey by the U. S. Bureau of Census sponsored by the Lubrication Committee of the American Petroleum Institute's Marketing Division.

Sales of industrial lubes accounted for more than 2,000,000 bbl. of the almost 3,000,000-bbl. increase as the total rose to 56,597,197 bbl. Automotive lube-oil sales increased only 173,811 bbl. The total included 52,665,993 bbl. of lube oil and 3,931,204 bbl. of grease.

Export sales accounted for 22% and 2.3% went to the federal Government. The remaining volume was sold domestically.

There's good material and plenty of it in these packing elements. (Note the big holes—big because the packer bores are big and unrestricted.)

TWO BASIC MODELS

Model J (Product 756-J) is long-string set. Model K (Product 756-K) is short-string set. Both come with or without hold-down buttons (double or single grip). The picture shows double-grip Model J.

How to make a dual-string hookup that works

Required: a dual packer that works

NOTHING DEFEATS THE ECONOMICS of a dual completion like a dual packer that leaks. You must have a positive and dependable packoff.

It's fundamental—to make a dual string hookup work, you must have a dual packer that works, one that packs off and holds. That, many operators state plainly, is the reason they are using the new Baker duals.

WHAT MAKES THE PACKOFF SO POSITIVE? The reasons are designed into the simple and rugged 3-element packoff mechanism you see in the pictures.

There's been a lot of favorable comment on this design. It holds so well it doesn't need the non-retractable metallic back-up rings that so often stick to the casing and defeat retrievability. The 3-element concept came out of a tough proving ground. It was adapted from Baker's high-performance retrievable squeeze packers, proved in thousands of high pressure downhole operations.

BUT WHEN YOU'RE MAKING THE HOOKUP, you discover that while a positive packoff is essential, it isn't everything. You must have flexibility, too.

When you want to space out, to test packers before displacement—that's when you discover the importance of a packer that offers repeat setting.

A BAKER SNAP-SET DUAL is one packer that gives you both pressure holding power and flexibility. You set and pack off by setting down minimum weight—and the packer holds. You release by picking up.

It's just that simple. You don't pressure, you don't rotate, you don't drop balls—and you don't come out of the hole to re-cock.

You set and unset as many times as you need to. And when your hookup is made, you've got one that works.

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SNAP-SET DUAL PACKERS

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40 PAGES OF FACTS

With big pictures and few words, a new brochure tells the interesting engineering facts about Baker's new Snap-Set Dual Packers. Get it from Baker representatives, or write to Baker Oil Tools, Inc., P.O. Box 2274, Terminal Annex, Los Angeles 54, California.

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Aviation progress—from the faltering flight at Kitty Hawk to the latest continental jet hop—has depended in large part on the fuels and lubricants that bring planes to life.

The 12 horsepower engine that flew Orville and Wilbur Wright into history was no more demanding than a Model-T's motor. But today's more discriminating jet turbines need fuel that tests purer than the milk we drink and lubes that won't fail in the numbing upper air. The years between have been bridged by millions invested in oil laboratories and refineries.

Sinclair Refining Company is proud of its role in aviation progress that dates back to the World War I "Jennies." Today, that company is a major supplier of jet fuel to airlines and the armed forces. *It supplies over 40 per cent of the lubricants used by all major scheduled airlines in the U.S.*

Passing the oil can in the competitive aviation markets calls for resourcefulness in research and manufacturing skill. *Where confidence counts with customers, Sinclair flies high.*

SAE—Sinclair salutes the Society of Automotive Engineers for stimulating the research and the exchange of technical data which has brought constant improvement in self-propelled vehicles, their engines and related products. Through its 25,000 members, the SAE keeps Americans moving safer and faster on land, air and sea. Organized in 1905, it is one of the largest engineering societies in the world.

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Independents Fear More Controls Are Coming

• Worry over wider regulation plagues NPRA's first meeting. Industry is warned that such practices as price wars must stop, or government will act.

THE FEAR of much greater government regulation looms large in the minds of independent refiners, marketers, and producers.

The tendency of separate industry segments to run to Washington for solution to their problems is bringing a growing recognition that one result is inevitable—more government control for all.

This fear, repeatedly expressed publicly and privately, was the thread running through the first meeting of the new National Petroleum Refiners Association meeting in Atlantic City last week.

The common preoccupation among members of the successor to the Western Petroleum Refiners Association and the National Petroleum Association had a unifying influence on the diverse groups at the convention.

So it was that a panel on "The Interdependence of the Independents" drew top attention.

The theme was this: If the industry segments don't recognize their mutual interest and solve such problems as price wars, Washington is bound to step in with its own cure.

Here are samples from the panel:

Reid Brazell, NPRA president—"Unless the top executive officers of oil companies assume their responsibility and stop practices that lead to these ruinous price wars that will wipe out the independent refiner and some smaller major companies, I feel sure the elected representatives of the people will pass legislation that, although aimed to preserve competition, will hurt all of us, including the public."

E. K. Bennett, president of the National Oil Jobbers Council—"Unless we in this industry collectively recognize and accept our interdependence and discharge the responsibility which this carries with it, there is no alternative, in the long run, to increased governmental regulation."

Alvin C. Hope, president of the Independent Petroleum Association of America—"I believe the last thing anyone in this industry wants to see is concentration to an extent which would make the industry a sitting duck for federal controls, if not nationalism. I hope we can approach all our problems in a spirit of dedication directed at preventing that awesome eventuality."

NPRA President Brazell warned major companies they had better conduct their operations so as to preserve the independents.

Each department, he said, should be operated on an economically sound basis.

He declared that if the manufacturing department pursues the incremental barrel regardless of economics, or the marketing department thinks only of volume, there will be but one result.

"This can destroy the independents in every branch of the industry and bring the free competitive system down with them."

Brazell noted that "nonsensical price wars" rage in most of the large-volume U. S. markets, and that this situation has existed in varying degrees for 3 years.

"No price war that I have known about ever sold one extra gallon of product," Brazell said. "It only hurt the company, its employes, and its stockholders.

"I wonder how long the stockholder and the public will put up with such irresponsible management?"

Bennett, the jobber spokesman, said his group's worst problems are price wars and the practice by refiner-suppliers of selling to consumer accounts at a lower price than to jobbers and dealers.

And, he added, only the suppliers can do anything about them.

Bennett said a realistic tank-

Taxes Up, Sales Down in Pennsylvania

ARE STATE gasoline taxes nearing the point of diminishing returns?

Oil men who think so are watching closely the trend in Pennsylvania, where this year taxes are higher and sales are lower than in 1960.

The federal tax on gasoline rose 1 cent last October 1. Pennsylvania jumped its state tax from 5 to 7 cents on April 1, bringing total taxes to 11 cents a gallon.

So far this year, sales have been running about 2% below the level of 1960—and 1960 wasn't a good year.

There was one tremendous month—March—when service stations loaded up before the new tax went into effect. But April was off by even more than the March increase (table).

Except for May, when there was some compensation for the lack of sales in April, and the big month of March, all months through July have run below 1960. In total volume, sales during the first 7 months were off by 37,815,000 gal.

Pennsylvania marketers are hoping for a pickup. But they're afraid that gasoline, the goose that has been laying the state's golden revenue eggs, is too overtaxed to recover.

Gasoline Consumption in Pennsylvania

(Taxable Gallons)

	1961	1960	% Change
January	232,255,565	238,320,450	− 2.55
February	216,809,445	230,700,239	− 6.02
March	310,661,555	254,341,744	+22.14
April	207,682,912	276,616,217	−24.92
May	276,868,901	273,252,792	+ 1.32
June	289,982,309	291,287,771	− 0.448
July	282,079,323	288,635,935	− 2.272
Seven-month subtotal	1,816,340,010	1,853,155,148	− 1.987

wagon price would be a great boon.

"If my supplier and others would say that they were going to make a profit on every gallon of gasoline they sell, I believe I would be safe in saying to my supplier you can forget about any price protection for me."

Hope said IPAA members are realizing more and more that they can't expect improved crude-oil prices until refiners get higher prices for products, especially gasoline.

And higher prices are essential, he said, if the U. S. reserves position is to be maintained.

Hope said producers of oil and natural gas in 1959 received $7.9 billion from the sale of 2.2 billion barrels of crude and the crude equivalent of 1.9 billion barrels of natural gas.

This amounted to 4.6 cents a gallon in income on 170 billion gallons of petroleum.

Expenditures for exploration, drilling, and production in the same year totaled $6.9 billion, or 4 cents a gallon.

This left a margin of 6 cents, Hope said. Out of that margin producers paid local, state, and federal income taxes, interest on debt, and a return to investors.

He urged mutual understanding and cooperation among all industry segments to solve problems and thus prevent federal control.

Texas Shelves Record Spacing Request

RECORD-wide gas spacing for Texas has been rejected—at least temporarily—for wells in Rojo Caballos field in Pecos County.

Mobil Oil Co., due to this field's extremely high drilling costs and great depth, had sought a Railroad Commission order permitting 1,280-acre well spacing.

But the agency apparently did not completely slam the door on the idea. Its notifying letter to Mobil said: "The commission declined to approve . . . because there is insufficient evidence available at this time for the subject reservoir to properly support a 1,280-acre spacing rule."

Since the commission didn't act immediately to establish closed spacing in the field, its statement apparently indicates the matter will remain open for a possible new look in the future.

Mobil spokesmen are fearful that drilling by other operators in coming months, however, may make 1,280-acre spacing impossible at some later date. At present there are only three completions in the field (all Mobil's). Gulf Oil Corp. is drilling one now.

There was no operator opposition to Mobil's request at the hearing 2 months ago. But some royalty owners and landowners did protest.

The three Mobil completions cost the company more than $5,000,000, due largely to severe lost-circulation and high-pressure troubles.

Imperial Boosts Canadian Crude Prices

CANADA has supplied the answer as to whether Canadian crude prices would be raised or U. S. prices cut as a result of the devaluation of the Canadian dollar.

Imperial Oil Ltd., Canada's leading purchaser and producer, last week increased postings by 10 cents a barrel on all light crudes in western Canada.

This generally covered the crudes in common use in both domestic and export trade. Exports to the U. S. averaged around 160,000 bbl. daily the first half of this year and are estimated at close to 200,000 bbl. daily this fall.

Imperial's move partially offsets the effective price reduction to U. S. refiners which resulted from a 6-cent decline in the exchange value of the Canadian dollar.

Industry Briefs . . .

Stockholders of Standard Oil Co. (Ky.) and California Standard have approved merger of the two firms. Kyso will become a Standard of Cal subsidiary next month in a stock exchange deal (OGJ, June 19, p. 64).

Murphy Corp. gained a 20,000-bbl. refinery, seven product terminals, and 212 gasoline outlets through its merger with Ingram Oil & Refining last week. Acquisition of the Ingram properties boosts Murphy's total marketing outlets to 850 in 24 states, the District of Columbia, and eastern Canada (OGJ, July 3, p. 84).

Progress review by Interstate Oil Compact Commission subcommittee making a study of marketing equality for domestic crude in the U. S. has been postponed until September 28. Review was set up at Oklahoma City September 11, but Texas and Louisiana members of subcommittee were unable to attend because of Hurricane Carla. Rescheduled session will be in Biloxi, Miss., the day before meeting of IOCC's executive committee.

Purchase of Toronto Pipe Line's 60-mile crude-gathering and transmission facilities in Cut Bank field, Montana, was announced by Teton Pipe Line Corp., Denver. Teton has built new storage and tank-truck-receiving facilities which connect with the recently-completed Glacier pipeline at Cutbank.

First-half earnings of 42 oil companies increased 11.1% to $1,708,-314,000, although 16 of the companies had earnings below the first half of 1960. First-quarter net was up 13.1% while that for the second quarter resulted in lower profits for many domestic integrated refiners as compared with the 1960 period, according to the survey by Carl H. Pforzheimer & Co.

Purchase of three oil wells and 2,594 acres of leases in Billington Spraberry field, Martin County, Tex., for $400,000 was announced by Texas National Petroleum Co. Sellers were G. T. Trusler, San Angelo, and G. M. McGarr, Fort Worth.

Majority interest in Heart of Texas Mining Corp. has been acquired by Tex-Star Oil & Gas Corp., Dallas. Heart of Texas processes and markets sand used in well fracturing. The sand deposit is near Brady, Tex.

CONTROL . . . essential element in economy!

In any engineering or construction project the real basis of economy is fast completion. Brown & Root has become legend for putting plants "on the line" ahead of schedule. ▲ This is possible because, with its own personnel and equipment, Brown & Root has the capability of a "turnkey" job. Every step is carefully controlled, from engineering through the manifold steps of construction and equipment installation. This "control" can be interpreted in fast, economical completion for you. ▲ If your organization is planning new construction or plant expansion, you'll profit by talking to the man from Brown & Root.

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Mobil Dumps Octane in Favor of Megatane

• New rating system is supposed to cover all gasoline qualities and give Mobil a "unique selling proposition" to be used with "new" gasolines.

A "REVOLUTIONARY" advertising campaign will be kicked off next week by Mobil Oil Co.

It will incorporate three radical departures in gasoline promotion:

...Its bold and ambitious aim will be to destroy the public's image of octane rating as the symbol of total gasoline quality. In its place Mobil ad men hope to install their company's own invention called the Megatane system, which was unveiled last July in advertisements in the trade press.

...A continuous sustained promotion will be conducted, in contrast to the custom of mounting two major efforts a year, in the spring and fall.

...A competitive hard-sell technique of the kind that has been foreign to the oil business will be employed.

The campaign will be the first results of Mobil's switch last March to a new advertising agency. Ted Bates & Co., known for its hard sell, especially in television. The Bates theory is that each ad has to have a "unique selling proposition" powerful enough to sway masses of customers.

This would be the Megatane system, and the two "new gasolines" Mobil is introducing which rate very high on the new scale.

Mobil will spend more than $4 million on the promotion this year in television and newspapers, with the budget weighted more than four to one in favor of TV.

Mobil's Megatane . . . Mobil announced that it had adopted the system that it calls Megatane for evaluating all performance qualities desired in a gasoline and is departing from the "octane mistake."

The octane method of rating gasoline, Mobil says, was developed 37 years ago when knocking was the most serious gasoline performance problem. It measures only two of the 21 qualities of the ideal gasoline while Mobil's system evaluates all of them, according to V. A. Bellman, marketing vice president.

Megatane ratings are arrived at by testing all of the qualities for a certain minimum effective performance level. Each one is given equal weight on the scale. The rating is simply the sum of the qualities present that meet minimum standards.

A rating of 14 and above is considered in the high-Megatane range. Mobil says its regular is 16 and its premium is 19. The premium thus would lack but two of the qualities to be an ideal gasoline.

Megatane function . . . Consumer research has indicated that over-all gasoline quality has become firmly identified in the mind of the motorist with octane rating.

Octane rating to him came to mean quick starting, fast starts, deicing and all other things that good gasolines are supposed to have. As a result, Mobil felt a marketer with gasoline of a high research octane rating—and little else—could create the impression that his product had everything.

On the other hand, the marketer who spends money to improve his gasoline in several ways other than in anti-knock quality had no means of selling the improvement.

To tell the total story, Mobil became convinced that the word "octane" had to go. The result was the new scale, denoting much or many (for mega) qualities in gasoline.

"The Megatane scale," explained a spokesman, "is a vehicle to give credit for raising the quality of our product.

Megatane's future . . . Is the Megatane scale simply a means of promoting Mobil gasoline, or does the company expect to point the way for a new industry tool to evaluate over-all gasoline quality?

Stung by skepticism of competitors who have dismissed the scale as an invention of the advertising department, a spokesman recalls the brickbats which greeted Shell's TCP—the first phosphorous additive. Eight years later, there are only two major marketers who do not have a phosphorous additive in their gasoline.

"They do not advertise it, but it's there," he explains. "I expect the same thing to happen to the Megatane system of ratings.

"It is sound technically," he insists. "This is no advertising gimmick. We are willing to take on any technical expert that anyone cares to throw at us."

Texaco Claims First Septuple

THE world's first oil and gas well to produce from seven separate zones simultaneously has been completed by Texaco Inc.

The septuple completion was made in a well at Blessing, Tex., some 70 miles southwest of Houston. It produces from two oil horizons and five different gas strata between 7,020 and 8,553 ft.

The two oil zones have an aggregate potential of 316 bbl. daily and the five gas zones' potential is 7,500,000 cu. ft. daily.

The new record, however, may not stand long. At least one christmas tree capable of handling an octuple completion has been installed in McFaddin field of South Texas (OGJ, Feb. 20, p. 83).

Texaco's completion was made by the now-accepted method of running multiple strings with smaller concentric strings inside them. The well has four strings of 2⅞-in. tubing, three of which have 1¼-in. tubing inside (OGJ, July 17, p. 61).

Three other wells in Texas have been completed from six zones simultaneously.

The seven-zone producer is the 1 D. V. McIntosh in Blessing field.

Perforations are at 7,020-26 ft. and 8,480-82 ft. for oil. Gas is produced through perforations at 8,113-19 ft., 8,159-75 ft., 8,270-75 ft., 8,416-22 ft., 8,429-32 ft., and 8,549-53 ft.

Commons Urges Britain to Import Saharan Gas

• House of Commons committee backs commercial tanker shipments of liquefied methane from North Africa, asks government to endorse plan quickly. But political angles are involved: Coal-industry opposition, Algerian turmoil.

Paul Swain
International Editor

ONLY two things—both of them political—stand in the way of commercial tanker shipments of liquefied North African natural gas to Great Britain.

The way has already been paved for striking down one of the political roadblocks. The other could be more complicated.

Final decision on whether Great Britain will really get down to cases on natural-gas imports has been left up to the British Government.

Since 1960, when the Methane Pioneer, a small converted freighter, made seven successful voyages from southern Louisiana to England, it has been an open secret that moving liquefied natural gas by tanker is technically and economically feasible. But the British have had to deal with domestic political pressures which opposed the scheme.

Now a select committee of the House of Commons has given importation of liquefied methane its unqualified stamp of approval—as long as the gas volumes do not get out of hand.

The committee urges that the government move fast. The British gas industry, which like coal is nationalized, has always operated with gas produced from coal. It desperately needs a cheaper product.

The government is faced with overriding or simply ignoring the self-interest protests of the nationalized coal industry and coal-mining unions. All figures so far submitted indicated that Saharan natural gas, liquefied at a Mediterranean plant and shipped by refrigerated tanker to England, will be cheaper than gas manufactured by British coal. Its calorific value is much higher.

Opposition from nationalized coal and from coal labor has been intense.

In its affirmative recommendation and its plea for speed, the Commons committee pulled the sharpest teeth of the opposition by limiting its endorsement to "present proposals." These call for importing only about 10% of British gas needs, which are steadily rising. The committee points out that the Saharan gas would be used for enriching the coal gas.

The committee approval could well pave the way for the government to override opposition at home.

The second, and potentially more dangerous, political hurdle in the way of the program is the instability of Algeria. The inherent danger to an energy-supply source from a country in rebellion must be giving the British pause.

The olive branch extended to the rebels by General Charles de Gaulle last week may help solve this thorny problem in the path of large-scale gas importation. De Gaulle abandoned earlier policy and told the Algerian nationalists that France will recognize their political sovereignty over the vast Sahara if they will make agreements with the French for development of the oil and gas in the desert (OGJ, Sept. 11, p. 99).

The committee report . . . The House of Commons select committee heard plans and figures from the Gas Council, the National Coal Board, and the Ministry of Power before it came to these basic conclusions:

. . . Gas is too expensive in Great Britain today. Unless the British gas industry can find some way to reduce its costs of manufactured gas at least 30%, the future of the whole industry is in doubt. Costs of manufactured gas from both oil and coal range from $1.07 to $1.75 per M.c.f., depending on the process used.

. . . Two alternatives appear to be the only possible ways to cut costs: Import Saharan natural gas in liquefied form, or start large-scale direct gasification of Britain's low-grade coal by the Lurgi method (OGJ, Nov. 16, 1959, p. 142).

. . . The Lurgi method, naturally supported by the British coal industry because it makes use of its product, is considered by the committee as the less likely solution to the problem. Capital investment for Lurgi plants is large and the calorific value of the end-product gas is low. The gas must be enriched with butane to make it useful for British consumption.

Britain's first Lurgi plant went into operation this summer at Westfield, Scotland, at a cost of $23.8 million. It produces daily 30,000 M.c.f. of gas which must be enriched with butane from the Grangemouth refinery. A second plant at Coleshill, England, being built at a cost of $26.6 million, is designed to produce 50,000 M.c.f. daily.

. . . Liquefied-methane imports are the quickest and most practical solution to Britain's gas problem, according to the select committee. Figures indicate that with an investment of less than $30 million for equipment, the Gas Council can import liquefied natural gas from the Sahara at the rate of 100,000 M.c.f. daily and deliver it to area gas boards at a cost of about 88 cents per M.c.f., leaving a margin of profit for the council. The Lurgi gas, enriched by butane, costs about $1.13 per M.c.f. to manufacture without any transportation costs.

In addition to much lower delivered costs, the 100,000 M.c.f. of Saharan methane would convert into 160,000 M.c.f. of standard British "town gas."

Even if the government should

"WE CAN MOVE MIGHTY CHEAP DIRT WITH A D7D"

HARVEY W. JONES, JONES CONSTRUCTION CO., NATCHEZ, MISS.

This is one of two Cat D7 Series D Tractors used by the Jones Construction Co. for site preparation and general construction work. Commenting on their ability to move cheap dirt, Mr. Jones said: "The D7D is the right size tractor for our oil field and other contracting work. It's large enough to do the job—and small enough to be easily transported. We're well pleased with the trouble-free operation the past year. A D7D can't be beat!"

How about you—are you moving dirt as cheaply as you can? An older model tractor that is paid for may seem to move dirt at low cost. But in reality it could be losing as much as it earns. It just can't move earth as cheaply as a new machine. Why?

The D7D, for example, is more powerful and easier to maintain than predecessor models. Its ability to do more work and do it for less cost could greatly increase your profit potential. You can check this by comparing the production and costs of your present equipment with the D7D. For the full story and a demonstration with measurable results, see your Caterpillar Dealer. He has some eye-opening facts. He'll lay them on the line for you!

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INCREASE YOUR EARNINGS WITH A D7D

D7D MONEY-EARNING FEATURES

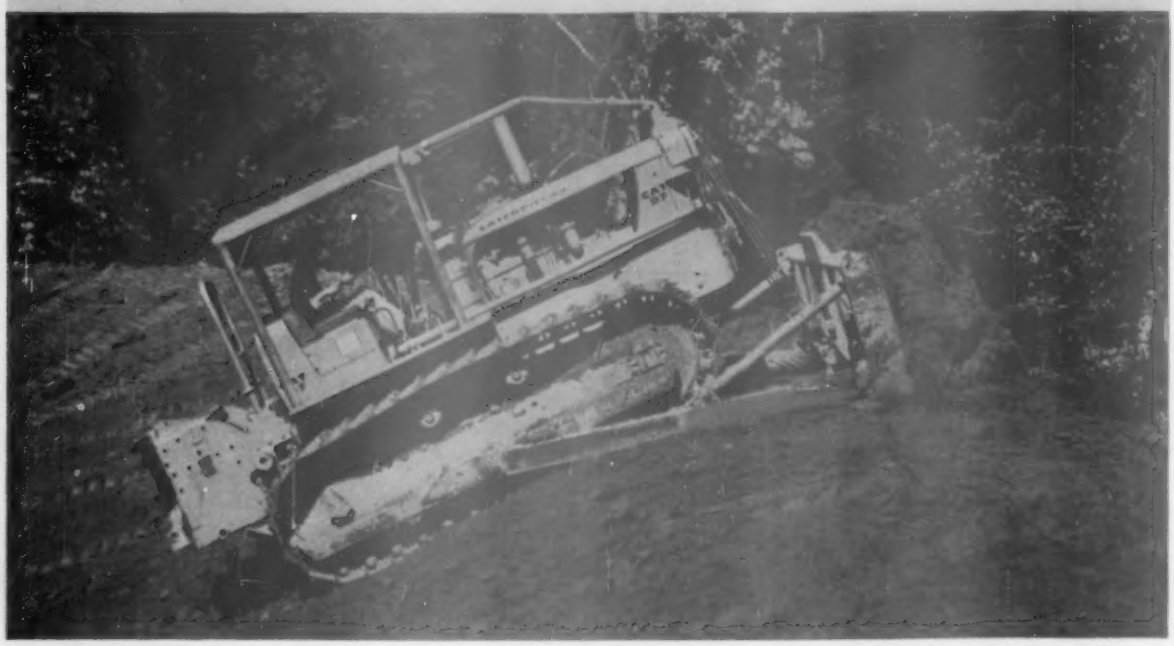
TURBOCHARGER—offered only on the D7D in its class. Addition of this unit has boosted HP to 140 at the flywheel, almost doubles lugging ability, delivers more efficient combustion for important fuel savings.

DRY-TYPE AIR CLEANER—removes at least 99.8% of dirt from engine intake air under all conditions. Materially lengthens engine life by protecting it from abrasive dust. Can be serviced in five minutes.

POWER TRAIN—stronger and better than ever, with final drive gear teeth strengthened 50%. Another factor increasing drive train life: an improved lubrication system for transmission, bevel gear and pinion.

ROLLERS—no more costly down time from improper or missed lubrication. Exclusive floating ring seals keep constant pressure on seal surfaces—oil stays in, dirt out. These rollers never need attention until rebuild time.

OIL CLUTCH—another exclusive in the D7D class. Users report up to 2000 hours of adjustment-free service on even the most severe applications. Clutch replacement almost unheard of!



decide on the Lurgi method, the committee pointed out, it would probably be necessary to import methane to enrich the lower-quality coal gas produced by the Lurgi plants.

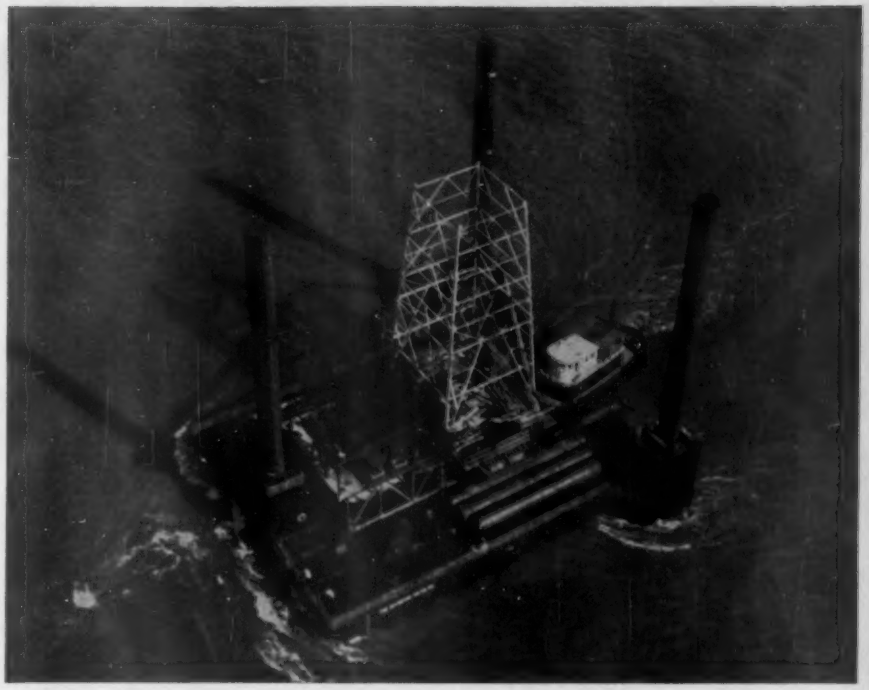
The importation plan . . . More than a year ago, Conch International Methane, Ltd., owned by Royal Dutch-Shell, Continental Oil, and Union Stockyards of Chicago, made an agreement with the French to build a liquefaction plant on the Algerian coast.

Conch International will have a half interest in a new company formed to build the plant, Cie. Algierienne du Methane Liquid (CAMEL). The French producing companies, SN Repal and CFP (A) which discovered the big Hassi R'Mel gas field, will split a 26% interest and Soc. Algerie de Development, Air Liquide, and the official Bureau de Recheres will divide the remainder.

Two refrigerated tankers of 28,000 tons each are planned to move the methane from North Africa to Canvey Island in the Thames River. Each would carrry 11,000 tons of liquefied methane (575,000 M.c.f.). One will be owned by Conch International and the other by Methane Tanker Finance, a newly organized private British firm. Both would be chartered by British Methane, Ltd.

All the investment involved in the program up to this point will be carried by the private firms involved. The Gas Council will have to lay out an estimated $29.4 million for the British installations to handle the gas. This would include five 2,000-ton refrigerated storage tanks and plants to convert the natural gas into the equivalent of British town gas. Additional investment would be needed for a pipeline system to move the gas to the seven area gas boards in Great Britain.

The gas source . . . The Commons select committee brushed aside any suggestion of an unstable source for the gas imports with the comment that if the Saharan source proves unsatisfactory, the Gas Council "has others in mind." The committee added that the Gas Council regards the Saharan gas source "as reliable as the sources of oil"—which in the minds of many Europeans since Suez isn't too reliable.



Mobil Rigs for Offshore African Test

MOBIL International and a French partner soon will start their first offshore test off the West African country of Gabon.

The wildcat will be drilled from a new mobile jack-up barge which has arrived off Gabon after a tow across the Atlantic from Baton Rouge, La. Offshore International, Baton Rouge, is drilling contractor.

The barge is unusual in that it has a four-sided platform, but only three legs. The barge will support a 140 ft. mast.

Mobil is the operator on offshore portions of a 3,191,000-acre tract in which the company has 50% interest under a farmout agreement with SPAEF. The French company is operator on onshore areas. The companies also have a joint program on 2,984,000 acres in Middle Congo, immediately south of Gabon.

SPAEF currently produces 15,000 bbl. daily from a group of small fields on Point Clairette Peninsula of Gabon, where it retains 100% interest in the concession area.

Soviets May Ship Products to Morocco

THE all-pervading presence of Russian oil has made itself felt in Morocco, where the government has suspended all oil imports from the franc zone, and is urging importers to make up the difference with soviet products.

The government's move is the result of a balance of payments pinch in its trading with the French financial community, to which it formerly belonged.

French areas currently supply 60% of the country's 17,400-bbl.-daily demand. Russian products could easily be brought in to fill the gap under an unused provision of an existing trade agreement with Morocco.

Local marketers, especially those affiliated with American companies, are protesting the move. The government has suggested that importers unwilling to take Russian products can obtain supplies in Spain or the United Arab Republic.

The new government policy will be effective only a few months before a new 20,000-bbl. refinery opens in January. But the plant, jointly owned by Italy's ENI and Moroccan interests may also offer an entry to Russian oil to Northeast Africa.

East Germans Finally Make a Strike

EAST Germany is claiming commercial-scale discoveries for the first time after years of unsuccessful exploration work.

The soviet zone's Veb Erdoel und Erdgaskombinat, or Oil & Gas Commission, says it recently joined oil and gas in widely separated areas.

Oil was struck at about 7,200 ft. in a well near Reinkenhagen, between Stralsund and Greifswald in the Pomerania region of northern Germany. The well reportedly is flowing at the rate of about 560 bbl. daily, but no information has been disclosed on the thickness of pay or the sizes of chokes on test.

The wildcat originally was projected to below 12,000 ft. in search of the Zechstein formation in an anticlinal structure mapped in a seismic survey. But this was encountered at a shallower depth after a salt series several hundred meters in thickness had been penetrated. Pressure in the gas zone caused trouble, after which the well was deviated, and oil encountered.

The gas find reportedly was made southeast of Berlin, near Storkow. The reservoir, described as "prolific," will be developed in a three-rig program.

New Colombian Offset Tests 2,200 Bbl.

CITIES Service has brought in a second successful well on its 75,000-acre discovery block in Colombia's Middle Magdalena Valley.

The well, Payoa 2, tests 2,200 bbl. daily of around 34°-gravity crude from three zones between 9,400-9,700 ft. Total depth is about 10,000 ft. Tests were made on chokes of between ⅜ and ½-in.

The well is 3,100 ft. due south of Payoa 1, which came in earlier this year with a total flow of 5,410 bbl. daily from five zones topped at depths between 6,895 and 8,278 ft.

The three pays of Payoa 2, which are lenticular Tertiary sands, are roughly comparable to the lower pays of Payoa 1, and are lower on structure. The new well encountered gas in one of the upper pay zones of Payoa 1, while the other of the top Payoa sands was present in the second well.

Payoa 3 has been spudded about 6 miles southwest of Payoa 2, and is drilling ahead.

The Payoa wells are about 30 miles northeast of Barrancabermeja and 160 miles north of Bogota. They offset Sinclair Colombian's four Santos wells, which lie on a concession adjoining the Cities Service acreage on the west.

Santos 1 is about 1½ miles north-northwest of Payoa 1.

Colombia-Cities Service is operator on the block for itself and three partners, Ecopetrol, the government company, Richfield Oil, and Pan American International.

New Rules Clear Way For Private-Company Activity in Thailand

THAILAND has established a 50-50 profit split as the cornerstone of a new set of exploration regulations.

The new rules will clear the way for programs by private operators in one of the free-world's least-known areas. Applicants will be eligible for a maximum of three blocks of not more than 25,000 sq. km. (9,650 sq. miles) each. Exploration rights on each concession will run for 5 years.

There is already small production in the Muang Fang area, where the government has produced as much as 200 bbl. daily from shallow wells. Output reportedly is refined at a small refinery in the field.

Foreign Briefs . . .

Offshore rights to Israeli waters in the Mediterranean have been awarded to an unidentified Canadian firm. Preliminary surveys indicate the presence of stratigraphic traps in the area. A seismic survey will be started this fall.

A 1,000-bbl. refinery will be built at Elat, Israel, by Sonal, a local marketer. The products, diesel fuel, kerosine, and Bunker C fuel oil will be marketed in the southern part of the country. Crude will be supplied by the same "unidentified" sources which supply crude to the 16-in. Elat-Haifa pipeline.

A new 20,000-bbl. refinery owned by Caltex and the Turkish Government has gone on stream at Izmit near Istanbul, Turkey. Caltex, which financed the plant, will operate the facilities for 10 years after which it will sell its interest to a government company, Turkiye Petrolleri A.O. (TPAO). Caltex has 49% and TPAO has 51% interest in the refining company, Istanbul Peyrol Rafinerisi A.S. (IPRAS), which owns the plant. Caltex will supply the crude.

Union Oil Co. will assist General Exploration Co. of California in exploring a 10,000-sq.-mile concession in the Irrawaddy Valley of Central Burma.

A lump-sum contract for an expansion-modernization program at the 37,500-bbl. Barrancabermeja refinery of Empresa Colombiana de Petroleos has been awarded to M. W. Kellogg Co. The project will include a 9,150-bbl. vacuum-distillation unit and a phenol-extraction plant. Kellogg also will design and build a deisopentanizer and stabilizer units. Completion is scheduled for the fall of 1962.

A deep test will be started soon by Arco, Ltd., in Gippsland basin, Victoria, Australia. The Atlantic Refining Co. subsidiary recently obtained from Woodside Oil Co. an undivided 50% interest in exploration permits covering 9 million acres in the basin.

New petrochemical center being built at Lucania, on the heel of the Italian boot, will use new natural gas supplies discovered by ENI. ANIC, an affiliate of ENI, will invest $51 million in facilities to produce a general line of gas-based products. Other firms are planning two plastics plants involving total outlay of $72 million.

This mechanical-press forging has been cut in half to show the excess metal (within diagonal lines) an upsetter forging would probably include. Our mechanical-press forging saved 16 lb... and the cost of machining it.

thanks to ingenuity and a mechanical press

Most shops would make this forging (a cone drive gear) the *conventional* way—on an upsetter. The forging would weigh 73¾ lb.

Bethlehem, using a little ingenuity, makes it on a mechanical press. The forging weighs only 57¾ lb.

There's a 16 lb difference. 16 lb of steel our customer doesn't pay for . . . or pay to machine away.

When you make a forging on an upsetter, you're limited to punching through with a straight hole. When you make a forging on a mechanical press, you can (if you know how) forge closely to the final shape. This saves our customer a lot of metal and a lot of machining.

Why then couldn't *any* forge shop handle this job? For two reasons: (1) Not every forge shop is equipped with a mechanical press. (Bethlehem has 6.) (2) Not every forge shop is staffed with craftsmen who can make a mechanical press do tricks. (Our shop is; our men can.) Try us. You'll like the savings.

Steel

for Strength
. . . Economy
. . . Versatility

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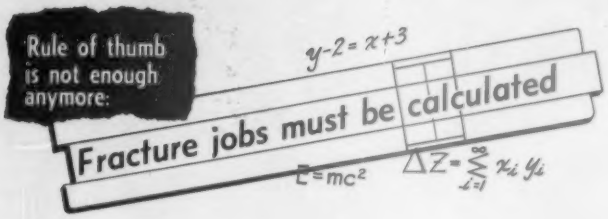


BY B. B. McGLOTHLIN AND J. L. HUITT
Gulf Research & Development Co., Pittsburgh
and
J. W. JENNINGS
Gulf Oil Corp. Technical Services, Houston

How to calculate a

Fluid and propping-agent injection schedule for high-capacity fractures

When should propping agent be added to the injected fluid? What concentration is best? Here's a method for calculating an injection schedule for a partial monolayer fracture system, including addition of propping agent to fracturing fluid.

RULE OF THUMB is no longer good enough for fracturing jobs.

Advances in technology, and field experience, now make it possible to design the mechanics of hydraulic fracture treatment, and to design on the basis of known reservoir conditions.[1-6]

But reservoir conditions vary from one formation to another, so the fracturing treatment must be tailor made for a particular formation to get the desired penetration and flow capacity of the fracture.

Some articles already published have dealt with fracturing-fluid properties and the fracture area generated under various conditions,[2 7-12] while others have dealt with the choice of propping agents, their placement in the fracture, and the resulting fracture flow capacity.[13-18]

All have contributed to the design of the mechanics of treatment, but little attention has been paid to the injection schedule. That is, at what point in the injection program should the propping agent be added, and in what concentration? This point is particularly important in designing a high-capacity fracture with a partial monolayer[16] of propping material.

Mechanics designed first. Scope of this article is limited to a method of calculating an injection schedule, so only brief mention will be made of several factors that must be considered first. An estimate should be made as to how much fracture area and capacity are needed for effective well stimulation.[1 2 5 19] Once this is found the "other elements of design" are considered on the basis of what is needed to get these results.

The other elements of design include method of well-bore preparation,[20-24] choice of fracturing fluid[2 7 12] and propping agent,[3 13-15 18] and pumping rate. In selecting a method of well-bore preparation, two important factors should be considered: (1) placement of the fracture, and (2) a well-bore opening to the fracture sufficient for the desired pumping rate.

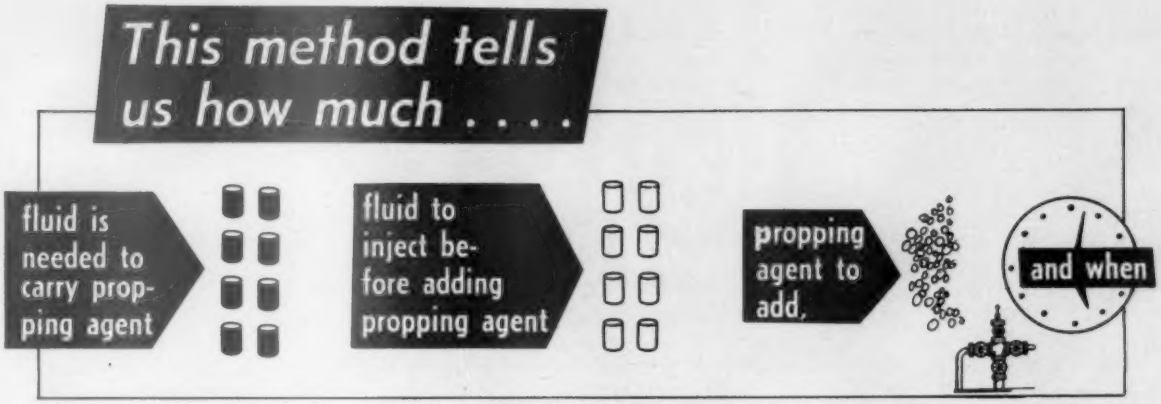
Selection of fracturing fluid should be based on fluid-loss properties, propping-agent carrying ability, compatibility, and viscosity characteristics. In selecting a propping agent, the type, size, and optimum concentration in the fracture needed for the desired capacity should be the controlling factors. Selection of pumping rate is based largely on economics and the factors discussed above. Where feasible, a pumping rate of at least 15 bbl. per minute (preferably higher with low-viscosity fluids) should be used. In routine operations the pumping rate is often selected on the basis of results of previous fracturing operations.

The injection schedule. It now becomes a matter of determining what portion of fracturing fluid is used to extend the fracture and what portion is used to carry the propping agent into the fracture. For these calculations certain data and assumptions are required:

- Needed fracture area.
- Desired type, size, and density pattern of the propping agent in fracture.
- Rate of fluid loss for fracturing fluid as determined on formation core samples under simulated fracturing conditions.
- Pumping rate.

As in most calculations made for downhole operations, certain assumptions are necessary. They limit the usefulness of the calculations in some cases, but the calculations are applicable to a majority of treatments. These assumptions are:

- A single fracture is created.
- Fracturing fluid is lost perpen-


This method tells us how much . . . .
fluid is needed to carry propping agent
fluid to inject before adding propping agent
propping agent to add,
and when

dicularly through the fracture faces and is controlled by the filtration effect of the fluid-loss reducing additive.

- Rate of loss of fracturing fluid through any portion of the faces of the fracture depends on length of time the portion has been exposed to the fracturing fluid.
- Pumping rate of the fracturing fluid is constant.
- Pressure in fracture is constant.
- Width of fracture during pumping is constant.
- Propping agent moves at same velocity as fluid carrying the agent.

Calculations

The injection schedule may be formulated by considering incremental volumes of fracturing fluid and finding the positions of the incremental volumes at the time pumping stops.

By this approach that portion of each incremental volume actually in the fracture when pumping ceases (zero for the first few incremental volumes) can be calculated. Now, since the remainder of each incremental volume is known, the correct amount of propping agent can be added to the incremental volume on the surface.

In making the calculations, it helps to visualize what happens to each incremental volume as it progresses away from the well bore. Since the pumping rate is constant, an incremental volume ΔV can be taken as the volume injected in 1 minute, or shorter time interval. First, consider ΔV_1, the volume injected during the first minute. As ΔV_1 moves away from the well bore, it filters through a fracture area. The fracture area through which ΔV_1 filters to leak off from the fracture at the average filtration rate, u_1, for the first minute is

$$\Delta A_1 = \frac{\Delta V_1}{u_1} \qquad (1)$$

Now consider the second incremental volume, ΔV_2, that is injected into the fracture. Only a portion of ΔV_2 leaks off through ΔA_1 because the filtration rate through ΔA_1 has been lowered by the filtration of ΔV_1. Therefore ΔV_2 filters through ΔA_1 at a new filtration rate, u_2. Since u_2 is smaller than u_1, a portion of ΔV_2 remains to filter through an additional area, ΔA_2, and since no fluid has previously filtered through ΔA_2, ΔV_2 filters through the additional area at the rate u_1. Expressed mathematically, the newly exposed area is

$$\Delta A_2 = \frac{\Delta V_2 - \Delta A_1 u_2}{u_1} \qquad (2)$$

By the same reasoning, the incremental area newly exposed during the leakoff of the third incremental volume is

$$\Delta A_3 = \frac{\Delta V_3 - [\Delta A_1 u_3 + \Delta A_2 u_2]}{u_1} \qquad (3)$$

These calculations are continued until the sum of the incremental areas, ΔA's, equals the desired fracture surface area.

At this point the number of incremental volumes that completely leak off during the formation of the desired fracture area has been found. If the last incremental volume to leak off completely during the fracture generation is referred to as ΔV_s, then a portion of incremental volume ΔV_{s+1} must remain in the fracture at the time pumping ceases. The portion remaining is Δv_{s+1} and is equal to ΔV_{s+1} minus that portion which leaked off as ΔV_{s+1} traveled through the fracture, exposed to the ΔA's through which it filtered at various rates. Expressed mathematically,

$$\Delta v_{s+1} = \Delta V_{s+1} - [\Delta A_1 u_{s+1} + \Delta A_2 u_s + \ldots + \Delta A_{s-1} u_3 + \Delta A_s u_2] \qquad (4)$$

and the area (two fracture faces) that Δv_{s+1} covers is

$$\Delta a_{s+1} = \frac{2\Delta v_{s+1}}{W_p} \qquad (5)$$

where W_p is the fracture width during the pumping.

The area Δa_{s+1} is at the fracture extremity and Δv_{s+1} occupies that portion of the fracture defined by Δa_{s+1}. Thus, ΔV_{s+2} cannot filter through Δa_{s+1} and that portion of ΔV_{s+2} which remains in the fracture upon completion of the pumping is

$$\Delta v_{s+2} = \Delta V_{s+2} - [\Delta A_1 u_{s+2} + \Delta A_2 u_{s+1} + \ldots + \Delta A_{s-1} u_4 + (\Delta A_s - \Delta a_{s+1}) u_3] \qquad (6)$$

The fracture surface area that Δv_{s+2} covers is

$$\Delta a_{s+2} = \frac{2\Delta v_{s+2}}{W_p} \qquad (7)$$

Likewise, ΔV_{s+3} cannot filter

through Δa_{a+2} or Δa_{a+1}. Therefore, the volume of ΔV_{a+3} that remains in the fracture at the time pumping ceases, if ΔA_a is greater than $\Delta a_{a+2} + \Delta a_{a+1}$, is

$$\Delta v_{a+3} = \Delta V_{a+3} - [\Delta A_1 u_{a+3} + \Delta A_2 u_{a+2} + \ldots + \Delta A_{a-1} u_5 + (\Delta A_a - \Delta a_{a+2} - \Delta a_{a+1})\, u_4] \quad (8)$$

However, if ΔA_a is less than $\Delta a_{a+2} + \Delta a_{a+1}$, then

$$\Delta v_{a+3} = \Delta V_{a+3} - [\Delta A_1 u_{a+3} + \Delta A_2 u_{a+2} + \ldots + \Delta A_{a-2} u_6 + (\Delta A_{a-1} + \Delta A_a - \Delta a_{a+2} - \Delta a_{a+1})\, u_5] \quad (9)$$

The fracture surface that Δv_{a+3} covers is

$$\Delta a_{a+3} = \frac{2\Delta v_{a+3}}{W_p} \quad (10)$$

These calculations are continued until the sum of the Δa's is approximately equal to the sum of the ΔA's. In a sense, the ΔA's "progress" to the fracture extremity; whereas the Δa's "regress" to the well bore.

In the calculations discussed above it was shown that those incremental volumes from ΔV_1 through ΔV_a leaked off during the generation of the fracture area. These incremental volumes are often referred to as the pad volume. If propping agent is added to the pad volume, it is deposited within the fracture as the pad volume leaks off or is "picked up" and carried by the fluid injected later. For example, if propping agent is placed in ΔV_1, it is "deposited" as ΔV_1 leaks off and must then be carried by ΔV_2. Since ΔV_2 leaks off also, the propping agent placed in ΔV_1 and ΔV_2 would be left for ΔV_3 to carry in the fracture. This effect would be compounded with each incremental volume leaked from the fracture and the propping agent would become packed in the fracture. Where a packed fracture is desired, this condition would be beneficial.

In calculating an injection schedule for obtaining a high-capacity fracture by means of partial monolayer propping, no propping agent should be added to the pad volume (incremental volumes ΔV_1 through ΔV_a). The addition of the propping agent should begin with ΔV_{a+1}, of which the portion Δv_{a+1} remains in the fracture at the time the pumping ceases. For the partial monolayer fracture system the concentration of the propping agent is usually small and the increase in the incremental volume resulting from the addition of the propping agent is negligible. (See appendix.)

The area over which Δv_{a+1} is spread (at the time pumping ceases) has been calculated, and the desired density pattern of the propping agent is known.[14 15 16 18] At the time pumping ceases, fracture width during pumping, W_p, will decrease (by additional fluid leakoff) and the propping agent will be further concentrated. Since the density pattern (in terms of pounds per gallon, G_f) is based on a fracture width equal to the propping-agent grain diameter, the portion of ΔV_{a+1} remaining in the fracture when the fracture closes to a width, D, is $(\Delta v_{a+1})\,(D/W_p)$. The concentration of the propping agent added to ΔV_{a+1} at the pumping equipment can be calculated as

$$(G_p)_{a+1} = G_f(\Delta v_{a+1}/\Delta V_{a+1})\,(D/W_p) \quad (11)$$

These calculations are continued for the other incremental volumes that "fill" the fracture by using the same reasoning, which may be expressed by

$$(G_p)_i = G_f(\Delta v_i/\Delta V_i)\,(D/W_p) \quad (12)$$

where i refers to incremental volumes after *a*.

By the method of calculations discussed above the following can be found:

1. Pad volume that leaks off before fracture area is generated.
2. Volume of fluid needed to carry propping agent.
3. Volume of carrying fluid leaked off.
4. Concentration of propping agent needed at pumping equipment.

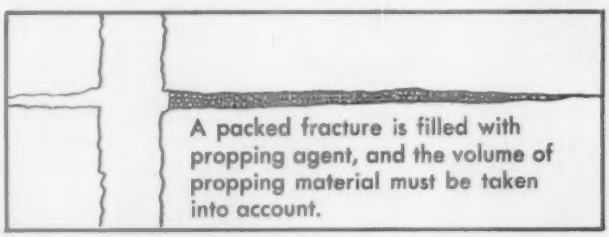
These are the essential elements needed in calculating an injection schedule. An example of these calculations and the resulting injection schedule are given in the Appendix.

Experience and Adjustments

This method of calculating an injection schedule has now been used in several hundred cases. The results of a number of the fracturing operations in which the injection schedules were calculated by this method were recently discussed.[19] These results show that the method is at least semiquantitatively applicable.

In a number of cases the volumes of fracturing fluid calculated by this method were compared to those calculated by a more rigorous method.[2] By using the more rigorous method of finding total volume of fracturing fluid, addition of the propping agent could not be handled as it was by using the numerical method presented here. However, the total treatment volumes agree well as shown in Table 1.

Naturally, shortcuts are possible in calculating an injection schedule.



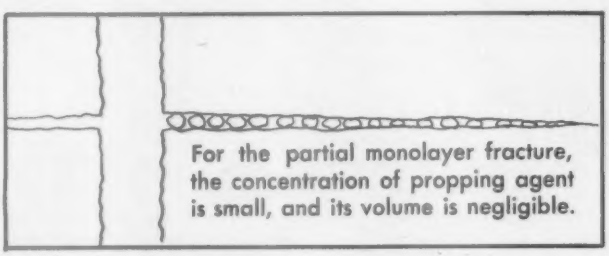


TABLE 1—COMPARISON OF METHODS OF CALCULATING TREATMENT VOLUMES

Formation—	Depth (ft.)	Fracture surface area (2 faces) ($ft.^2$)	Pumping rate bbl./min.	Calculated treatment volume (gal.)	
				Carter's equation[a]	Numerical method
Strawn sand	4,160	63,000	20	17,500	16,500
Dakota "D" sand	7,600	140,000	30	28,500	30,000
Frontier sand	1,300	140,000	30	25,500	27,500
Tackett sand	3,550	140,000	30	18,500	18,500
Tackett sand	3,135	140,000	30	27,500	28,500
Aux Vases sand	3,275	140,000	30	16,500	17,000
Second Frontier sand	7,175	140,000	30	27,500	28,500
Lower Albany dolomite	4,120	140,000	30	16,000	16,500
Lower Albany dolomite	3,080	165,000	30	17,000	17,500
Almond sand	5,225	140,000	20	17,500	17,500
Second Frontier sand	7,175	140,000	25	16,000	16,500
Skinner sand	5,000	140,000	25	18,000	17,000

[a] Data include both oil-base and water-base fracturing fluids.

At present, alignment charts are in use for portions of the calculations and constant pressure filtration equations are used when the fracturing fluid exhibits certain fluid-loss characteristics. Also, these calculations are easily programed for a computer. These topics are not discussed here because the purpose of this article is to present a numerical method of calculation.

In reviewing the necessary assumptions, it seems logical that the calculations will be refined with additional advances in technology. Two refinements that will probably come in time pertain to (1) fracture width during pumping and (2) velocity of the propping agent relative to the velocity of fluid in the fracture. In the calculations the fracture width during pumping was considered as a constant; and in the example (Appendix), a width of 0.02 ft. was assumed.

This value was based on the results of shallow-hole tests with 4-6 mesh propping agent. This value may change with field experience or by additional experimental work, and it may be possible to express the fracture width during pumping in terms of controlling variables. Velocity of the propping agent was assumed to be that of the fracturing fluid. With additional experimental work, the movement of the propping agent relative to the fracturing fluid may be handled as a variable; however, this refinement cannot be used effectively without the refinement of the fracture width during pumping. These refinements would be very useful, particularly since there are now several types of propping agents and a variety of fracturing fluids in use.

Conclusions. With this method the injection schedule can be divided into two parts, the fluid to be injected before the addition of the propping agent and the fluid to be used as the propping-agent carrying medium. In addition, concentration of the propping agent to be added on the surface to give the desired concentration in the fracture can be calculated.

APPENDIX: Some example calculations

The following data are available for making the injection-schedule calculations:

1. Fracture area desired is approximately 140,000 sq. ft.
2. Fracture capacity desired can be obtained with 8-12-mesh sand at a concentration of 2.5 lb. per gal. (Concentration in the fracture when the fracture width equals the propping agent average grain diameter.)
3. Fluid-loss data for the fracture fluid through formation core samples under conditions simulated for the fracturing operation (Figs. 1 and 2).
4. Pumping rate of 25 bbl. per minute.

In making the calculations, it is convenient to use a columnar arrangement as in Table 2. Column 1 of this table is the incremental volume number. Column 2 is the average rate of fluid loss through the filter surface, from Fig. 2. For example, the first number in Column 2, 4.55×10^{-3} $ft^3/ft.^2$/minute, represents the average fluid loss rate for the first minute that the fracture surface is exposed to the fracturing fluid. Columns 3 and 4 of the calculation table are constructed in the following manner:

$$\Delta A_1 = \frac{\Delta V_1}{u_1}$$

$$\Delta A_1 = \frac{141}{4.55 \times 10^{-3}} = 31{,}000$$

$$A_1 = \Delta A_1 = 31{,}000$$

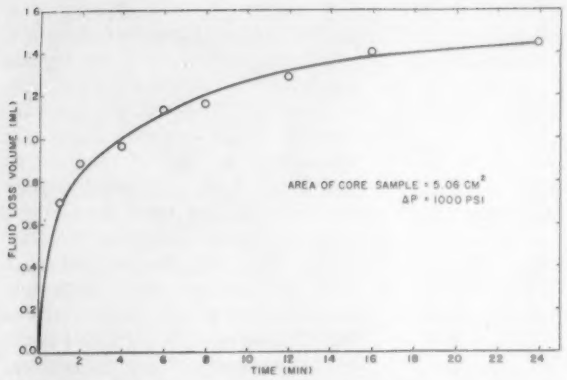
$$\Delta A_2 = \frac{\Delta V_2 - \Delta A_1 u_2}{u_1}$$

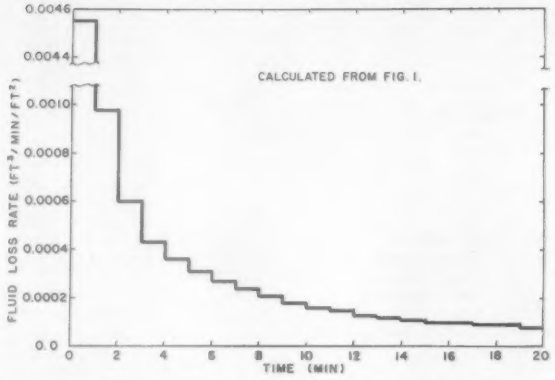
$$\Delta A_2 = \{141 - [(31{,}000)\,(0.98)] \times 10^{-3}\}/4.55 \times 10^{-3} = 24{,}300$$

$$A_2 = A_1 + \Delta A_2 = 31{,}000 + 24{,}300 = 55{,}300$$

TABLE 2—SUMMARY OF CALCULATED VALUES

1 ΔV (no.)	2 u ($ft.^3/min./ft.^2$)$\times 10^{-3}$	3 ΔA ($ft.^2$)	4 A ($ft.^2$)	5 v ($ft.^3$)	6 Δa ($ft.^2$)	7 a ($ft.^2$)	8 $G_{p\,(calc)}$ (lb./gal.)	9 G_p (lb./gal.)
1	4.55	31,000	31,000	...	.....	.....	...	...
2	0.98	24,300	55,300	...	.....	.....	...	...
3	0.60	21,700	77,000	...	.....	.....	...	...
4	0.43	20,200	97,200	...	.....	.....	...	...
5	0.36	19,000	116,200	...	.....	.....	...	...
6	0.31	18,100	134,300	...	.....	.....	...	...
7	0.27	.....	.....	80	8,000	8,000	0.57	0.50
8	0.24	.....	.....	99	9,900	17,900	0.70	0.75
9	0.21	.....	.....	110	11,000	28,900	0.78	0.75
10	0.18	.....	.....	117	11,700	40,600	0.83	0.75
11	0.16	.....	.....	123	12,300	52,900	0.87	1.00
12	0.15	.....	.....	128	12,800	65,700	0.91	1.00
13	0.13	.....	.....	131	13,100	78,800	0.93	1.00
14	0.12	.....	.....	133	13,300	92,100	0.94	1.00
15	0.11	.....	.....	135	13,500	105,600	0.96	1.00
16	0.10	.....	.....	138	13,800	119,400	0.98	1.00
17	0.10	.....	.....	140	14,000	133,400	0.99	1.00





FLUID-LOSS DATA needed for the calculation of an injection schedule is represented by these two curves. Fig. 1, left, was obtained through laboratory analysis of a formation core sample under conditions simulated for the fracturing operation. Fig. 2, right, was calculated from the data in Fig. 1, by finding the fluid loss rate per unit of fracture area.

$$\Delta A_3 = \frac{\Delta V_3 - [\Delta A_1 u_3 + \Delta A_2 u_2]}{u_1}$$

$$\Delta A_3 = \{141 - [(31{,}000)\,(0.60) + (24{,}300)\,(0.98)] \times 10^{-3}\}/4.55 \times 10^{-3} = 21{,}700$$

$$A_3 = A_2 + \Delta A_3 = 55{,}300 + 21{,}700 = 77{,}000$$

$$\Delta A_4 = \Delta V_4 - [\Delta A_1 u_4 + \Delta A_2 u_3 + A_3 u_2]/u_1$$

$$\Delta A_4 = \{141 - [(31{,}000)\,(0.43) + (24{,}300)\,(0.60) + (21{,}700)\,(0.98)] \times 10^{-3}\}/4.55 \times 10^{-3}$$

$$\Delta A_4 = 20{,}200$$

$$A_4 = A_3 + \Delta A_4 = 77{,}000 + 20{,}200 = 97{,}200$$

$$\Delta A_5 = \Delta V_5 - [\Delta A_1 u_5 + \Delta A_2 u_4 + \Delta A_3 u_3 + \Delta A_4 u_2]/u_1$$

$$\Delta A_5 = \{141 - [(31{,}000)\,(0.36) + (24{,}300)\,(0.43) + (21{,}700)\,(0.60) + (20{,}200)\,(0.98)] \times 10^{-3}\}/4.55 \times 10^{-3} = 19{,}000$$

$$A_5 = A_4 + \Delta A_5 = 97{,}200 + 19{,}000 = 116{,}200$$

$$\Delta A_6 = \Delta V_6 - [\Delta A_1 u_6 + \Delta A_2 u_5 + \Delta A_3 u_4 + \Delta A_4 u_3 + \Delta A_5 u_2]/u_1$$

$$\Delta A_6 = \{141 - [(31{,}000)\,(0.31) + (24{,}300)\,(0.36) + (21{,}700)\,(0.43) + (20{,}200)\,(0.60) + (19{,}000)\,(0.98)] \times 10^{-3}\}/4.55 \times 10^{-3}$$

$$\Delta A_6 = 18{,}100$$

$$A_6 = A_5 + \Delta A_6 = 116{,}200 + 18{,}100 = 134{,}300$$

For calculation purposes this volume is enough for the 140,000 sq. ft. of fracture surface area desired.

Next, construct Columns 5, 6, and 7. Column 5 is the volume of each incremental volume remaining in the fracture at the completion of the pumping. Column 6 is the surface area of the fracture that the incremental volumes cover at the instant pumping ceases. Column 7 is a summation of Column 6 and its last entry must be approximately equal to the last entry in Column 4. For these calculations, the fracture width during pumping is taken to be constant at 0.02 ft.

$$\Delta v_7 = \Delta V_7 - [\Delta A_1 u_7 + \Delta A_2 u_6 + \Delta A_3 u_5 + \Delta A_4 u_4 + \Delta A_5 u_3 + \Delta A_6 u_2]$$

$$\Delta v_7 = 141 - [(31{,}000)\,(0.27) + (24{,}300)\,(0.31) + (21{,}700)\,(0.36) + (20{,}200)\,(0.43) + (19{,}000)\,(0.60) + (18{,}100)\,(0.98)] \times 10^{-3} = 80$$

$$\Delta a_7 = \frac{2\Delta v_7}{W_p} = \frac{(2)\,(80)}{(0.02)} = 8{,}000$$

$$a_7 = \Delta a_7 = 8{,}000$$

$$\Delta v_8 = \Delta V_8 - [\Delta A_1 u_8 + \Delta A_2 u_7 + \Delta A_3 u_6 + \Delta A_4 u_5 + \Delta A_5 u_4 + (\Delta A_6 - a_7)\,u_3]$$

$$\Delta v_8 = 141 - [(31{,}000)\,(0.24) + (24{,}300)\,(0.27) + (21{,}700)\,(0.31) + (20{,}200)\,(0.36) + (19{,}000)\,(0.43) + (18{,}100 - 8{,}000)\,(0.60)] \times 10^{-3} = 99$$

$$\Delta a_8 = \frac{2\Delta v_8}{W_p} = \frac{(2)\,(99.0)}{(0.02)} = 9{,}900$$

$$a_8 = a_7 + \Delta a_8 = 8{,}000 + 9{,}900 = 17{,}900$$

$$\Delta v_9 = \Delta V_9 - [\Delta A_1 u_9 + \Delta A_2 u_8 + \Delta A_3 u_7 + \Delta A_4 u_6 + \Delta A_5 u_5 + (\Delta A_6 - a_8)\,u_4]$$

$$\Delta v_9 = 141 - [(31{,}000)\,(0.21) + (24{,}300)\,(0.24) + (21{,}700)\,(0.27) + (20{,}200)\,(0.31) + (19{,}000)\,(0.36) + (18{,}100 - 17{,}900)\,(0.43)] \times 10^{-3} = 110$$

$$\Delta a_9 = \frac{2\Delta v_9}{W_p} = \frac{(2)\,(110)}{(0.02)} = 11{,}000$$

$$a_9 = a_8 + \Delta a_9 = 17{,}900 + 11{,}000 = 28{,}900$$

$$\Delta v_{10} = \Delta V_{10} - [\Delta A_1 u_{10} + \Delta A_2 u_9 + \Delta A_3 u_8 + \Delta A_4 u_7 + (\Delta A_5 + \Delta A_6 - a_9)\,u_6]$$

$$\Delta v_{10} = 141 - [(31{,}000)\,(0.18) + (24{,}300)\,(0.21) + (21{,}700)\,(0.24) + (20{,}200)\,(0.27) + (19{,}000 + 18{,}100 - 28{,}900)\,(0.31)] \times 10^{-3} = 117$$

$$\Delta a_{10} = \frac{2\Delta v_{10}}{W_p} = \frac{(2)\,(117)}{(0.02)} = 11{,}700$$

$$a_{10} = a_9 + \Delta a_{10} = 28{,}900 + 11{,}700 = 40{,}600$$

These steps are continued in like manner until the sum of the Δa's approximates the value of A. By these steps it is found that 17 incremental volumes are required to produce the desired fracture.

The concentration of 8-12-mesh propping agent that should be added to the incremental volumes is then calculated as follows:

$$(G_p)_7 = G_f\,(\Delta v_7/\Delta V_7)\,(D/W_p)$$

$$(G_p)_7 = (2.5)\,(80/141)\,(0.0080/0.0200) = 0.57$$

$$(G_p)_8 = G_f\,(\Delta v_8/\Delta V_8)\,(D/W_p)$$

$$(G_p)_8 = (2.5)\,(99/141)\,(0.0080/0.0200) = 0.70$$

The remaining terms in Column 8 are similarly calculated. Since it is not practical to add sand at the rates shown in Column 8, more practical rates are selected by rounding these values, as shown in Column 9. This

completes the calculations and the injection schedule may be summarized as shown below.

Break down the formation with load fluid and establish an injection rate of 25 bbl. per minute. Inject the fracturing fluid and propping agent as follows:

Time interval (min.)	Fracturing fluid volume (bbl.)	Propping agent — Concentration (lb./gal.)	Propping agent — Amount (lb.)
6	150	0	0
1	25	½	525
3	75	¾	2375
7	175	1	7350

"Underflush" 1 to 2 bbl.
Volume of fluid = 425 bbl. fracturing fluid + load and flush fluids.
Amount of 8-12-mesh sand = 10,250 lb.

Effect of Propping-Agent Volume on Injection Schedule

In the procedure as described for calculating volumes for an injection schedule, the volume of the propping agent is neglected. With the assumptions that must be made in the calculations, the error that is introduced by neglecting this volume usually is not significant. For instance, if γG_f is less than 0.25 and D/W_p is less than 0.25, the error introduced by neglecting the propping-agent volume is less than 10%. However, if it becomes necessary to consider the propping-agent volume in the treatment-volume calculation, a trial-and-error method of solution can be used. In these calculations, the ΔV_i's would become the volume of the fracturing fluid plus the volume of the propping agents. Thus, the propping-agent concentration in the fracturing fluid at the pumping equipment must be known. However, this concentration cannot be found until the total-treatment fluid volume has been calculated.

The calculation procedure is to select a propping-agent addition rate and to calculate a pumping schedule by considering the propping-agent volume when added at this rate. A new propping-agent addition rate is then calculated. If this rate and the selected rate do not agree well enough, another estimate of propping-agent addition rate is made and the calculations are repeated. This process is repeated until satisfactory agreement is obtained.

Considering the range of variables and degree of precision for which the calculations are intended, this correction is seldom justified, because it is very time consuming.

Neglecting propping-agent volume in the treatment fluid volume would also affect the calculation of the propping-agent concentration. Usually, this consideration need not be made unless the propping-agent concentration is large. If the volume of the propping agent is considered in calculating the propping agent concentration at the pumping equipment, Equation 12 can be modified to become:

$$(g_p)_i = g_f\,(\Delta v_i/\Delta V_i)\,(D/W_p)\ ; \quad \text{for } i > a \qquad (A\text{-}1)$$

where $(g_p)_i$ and g_f are expressed in pounds of propping agent per gallon of total volume (fluid plus propping agent). (The error introduced by using Equation 12 instead of Equation A-1 would be less than 10% if G_f is less than 3 lb. per gallon for a propping agent having a specific gravity of 2.6 or 1.5 lb. per gallon of a propping agent having a specific gravity of 1.3). Equation A-1 can be rewritten in terms of the familiar G_f and G_p, which are expressed in terms of pounds of propping agent per gallon of fluid by noting that

$$(g_p)_i = (G_p)_i/[1 + \gamma(G_p)_i] \text{ and } g_f = G_f/[1 + \gamma G_f] \qquad (A\text{-}2)$$

Equation A-2 becomes

$$(G_p)_i/[1 + \gamma(G_p)_i] = G_f/[1 + \gamma G_f]\,(\Delta v_i/\Delta V_i)\,(D/W_p) \qquad (A\text{-}3)$$

By defining K_i as

$$K_i = (\Delta V_i/\Delta v_i)\,(W_p/D) \qquad (A\text{-}4)$$

and rearranging Equation A-3, it is found that

$$(G_p)_i = G_f/[(1 + \gamma G_f)\,K_i - \gamma G_f] \qquad (A\text{-}5)$$

Then the concentration of the propping agent in the fracturing fluid at the pumping equipment for any time interval can be calculated from Equation A-5. Fig. 3 can be used to solve Equation A-5 for propping agents having a specific gravity of 2.6 or 1.3.

List of Symbols

a_i = summation of Δa_i's from i = 1 to i = i, ft.²

Δa_i = surface area of both fracture faces that Δv_i covers in the fracture. ft.²

A_i = summation of ΔA_i's from i = 1, i = i, ft.²

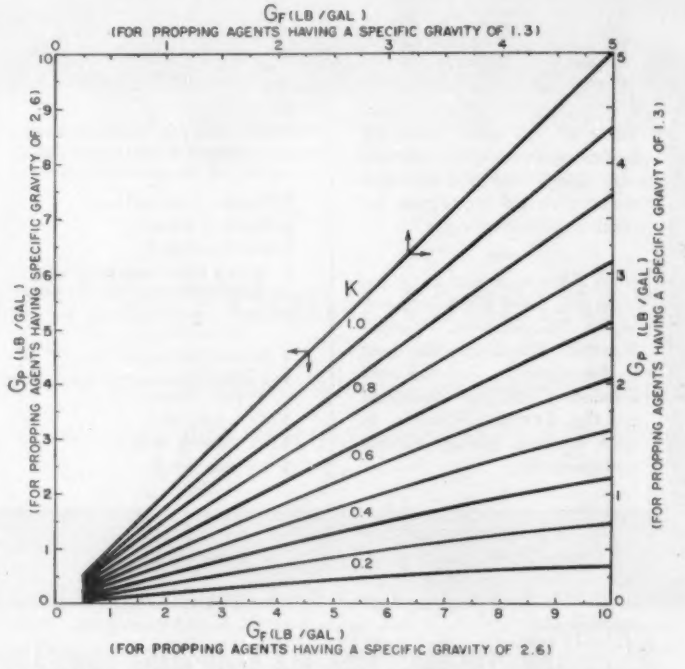
ΔA_i = total newly exposed surface area of both fracture faces that ΔV_i filters through, ft.²

D = average diameter of the propping agent, ft.

g_f = concentration of the propping agent in the fracturing fluid in the fracture when the fracture width is equal to D, lb. of propping agent per gal. of volume (fluid and sand).

G_f = concentration of the propping agent in the fracturing fluid in the fracture when the fracture width is equal to D, lb. of propping agent per gal. of fluid.

g_p = concentration of the propping agent in the fracturing fluid at the pump, lb. of



SOLUTION of Equation A-5 is given by this family of curves for propping agents whose specific gravities are 1.3 and 2.6, and for various values of K_i. Fig. 3.

propping agents per gal. of volume (fluid and sand).

G_p = concentration of the propping agent in the fracturing fluid at the pump, lb. of propping agent per gal. of fluid.

K_1 = dimensionless ratio defined by Equation A-4.

γ = specific volume of the propping agent, gal./lb. (for propping agents having densities of 2.6 and 1.3, the value of γ is 0.046 and 0.092 gal./lb., respectively).

S = total surface of both fracture faces of the desired fracture, ft.^{2}

u = fluid loss rate of the fracturing fluid, ft.^{3}/ft.^{2}/min.

Δv_1 = the portion of ΔV_1 that remains in the fracture when pumping is ceased, ft.^{3}

ΔV_1 = volume of fluid that is injected during the i^{th} time interval, ft.^{3}

W_p = fracture width during pumping, ft.

Subscripts

1, 2, . . . = pumping-time intervals.

n = the last pumping-time interval in which the incremental volume pumped is considered to be totally filtered.

i = general pumping-time interval.

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Acknowledgment

The authors express appreciation to the management of Gulf Oil Corp. and Gulf Research & Development Co. for permission to publish this article.

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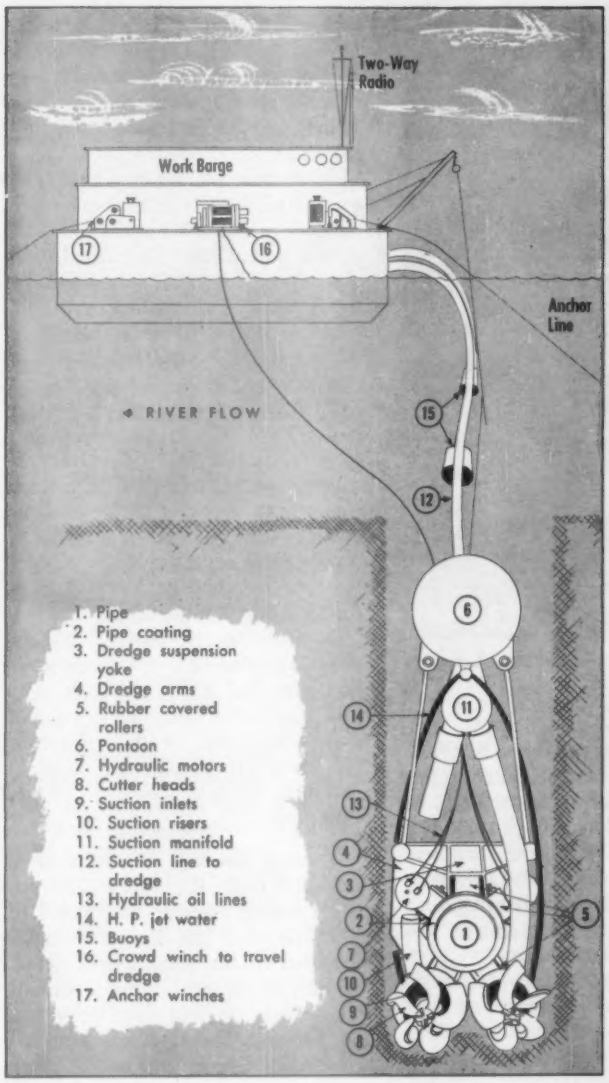
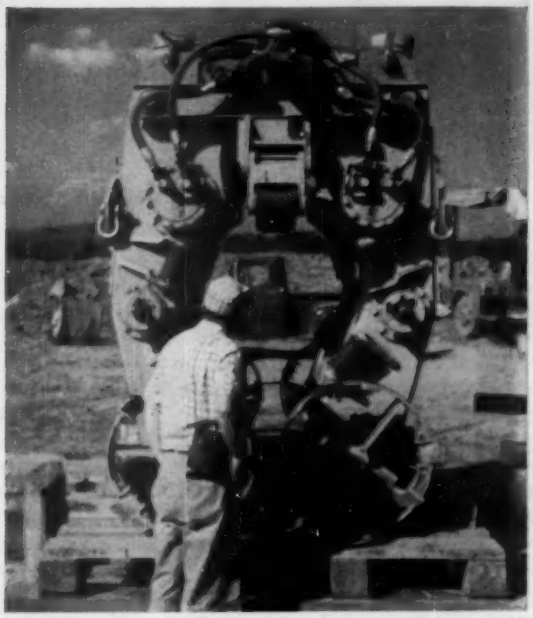


BARGE is anchored downstream of excavation so that cuttings will be discharged beyond trench.

BARGE pulled pipe across river in successive 650-ft. sections. Upstream and downstream anchors held barge in place.



TRENCHING AND PIPE LAYING are simultaneously performed by this machine shown here at Orinoco River site.

Trenching, pipe laying done together

- First pipeline across major Venezuela river is laid by novel method; dual diluent line, oil heating, unsupported aboveground line among unusual features.

TRENCHING and pipe laying were done simultaneously in making the first pipeline crossing of Venezuela's famed Orinoco River.

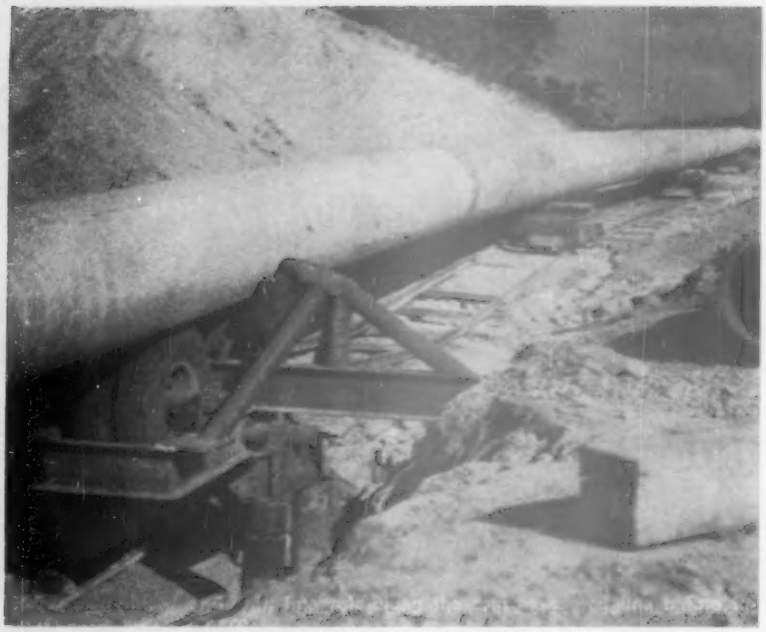
The crossing is part of the 45-mile, 24-in. line that connects Morichal field of Phillips Petroleum Co. of Venezuela with the company's terminal on the Orinoco.

BY JOHN P. O'DONNELL
Assistant Pipeline Editor

Morichal is in Central Monagas, north of the river, and the terminal is on its south bank, about 6 miles west of Puerto Ordaz.

The trenching was done and the line laid by the unique Tellepsen submarine trencher. It was the first time that an operation of this precise type was done by this method.

Straddles pipe. The trencher straddles the pipe after it has been laid on the river bottom. It is closed over the pipe by means of hydraulic



FLOATS were placed at 120-ft. intervals along the concrete-coated line before it was pulled into the Orinoco.

cylinders. Thick rubber rollers prevent the trencher from damaging the pipe.

The trencher is pulled back and forth across the river by a barge making a pass in each direction. As each pass is made revolving cutters, mounted on both ends of the trencher, gradually deepen the trench. It can make a maximum cut of 30 in. in a single pass. The depth of each cut and the number of passes depend on the nature of the river bottom. Divers walk the line after each pass to check progress.

The cutter heads are chain-driven by hydraulic motors. They turn in opposing directions to help keep the unit on an even plane. Cuttings are drawn up through risers to the surface and are discharged downstream, from the opposite side of the barge.

Use of the Tellepsen trencher in this instance was favored by the nature of the river bottom. It was probed to a depth of 30 ft. every 100 ft. and to a depth of 70 ft. every 500 ft. No rock was found either in the river bottom or on the approaches. Much of the first 10 ft. of the bottom is silt and is easily trenched. The line was laid 15 ft. below the river bed.

Bottom favorable. Condition of the bottom was one factor in determining the location of the 5,200-ft. crossing. Depth was also a consideration. Depth ranges from 95 ft. at low tide to 135 ft. at high tide. The river is about a mile wide here, one of the narrowest points on the river. It is also one of the deepest points and, consequently, presents less chance of channel shifting.

Normally the Orinoco begins to rise in late spring and reaches a peak in late August or September. At its peak it carries more water than the Mississippi. The crossing was begun early in January and at a time when the river had a zero velocity at the bottom.

Before the line was pulled into the river, each joint was sandblasted, tested, and coated. Seamless pipe with a wall thickness of 0.375-in. was used on the crossing. The coating was done in a compact, efficient yard set up on the site. Coating consisted of coal-tar enamel, glass wrap, and 0.375 in. of concrete. This gave the line a negative buoyancy of 45 lb. per ft.

Coated joints were combined into eight 650-ft. sections. All welds were X-rayed and each section was hydrostatically tested as was the entire line after it was in place.

Buoy supports. Sections were assembled on dollies on a narrow-gage railway. These dollies carried the pipe to the river. A winch mounted on a barge pulled the pipe into the river over a series of rubber rollers. Buoys were added every 120 ft. as the line was drawn into the river.

A section of uncoated pipe equipped with a bull plug was welded to the first section of the coated pipe. Cables connected to an eye in the plug made it possible for the barge to pull the line along the bottom. The barge was capable of pulling up to 200,000 lb. Little of this power was needed as the line practically pushed itself across as it slid down the grade into the river.

After each of the 650-ft. sections was pulled into the river, the barge was repositioned for the next. Four anchors, two upstream and two downstream, held the barge in place. It required about 3 hours for the tug to reposition the barge.

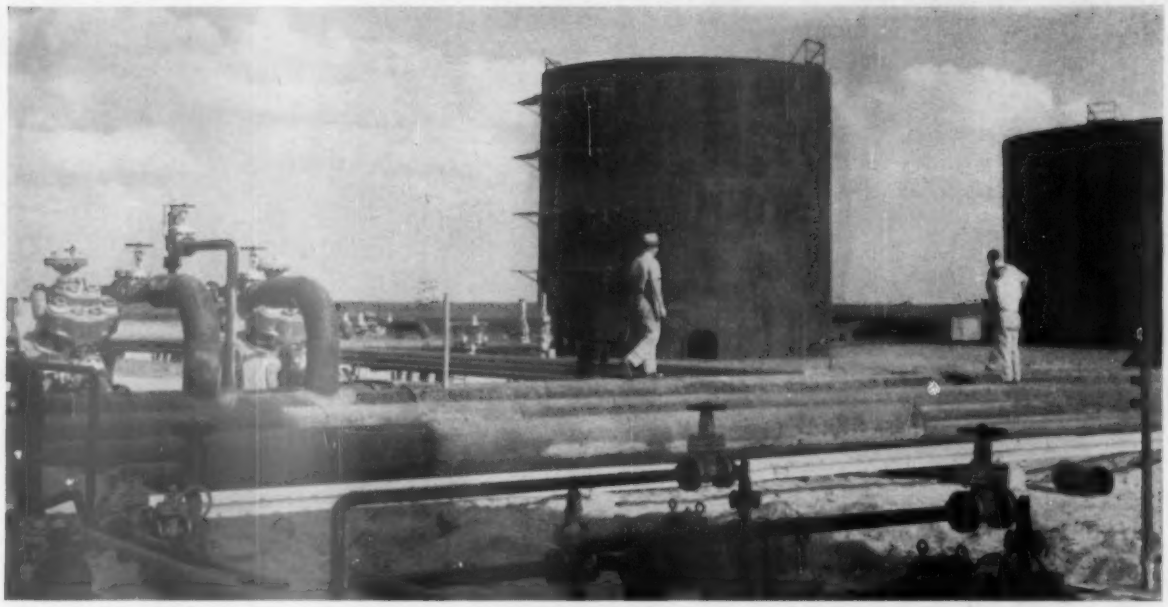
A 4-in. line, to carry a diluent, either kerosine or a low-grade gasoline, was laid across the river. This line was coated with coal-tar enamel, glass wrap, and an inch of gunite. As the ditching machine made its last pass, the 4-in. line was dropped into place.

Diluent needed. The diluent is required since the Morichal crude is of unusually low gravity. The 4-in. line will carry the diluent from the terminal to Morichal where it will be introduced into the crude stream. The crude oil will also be heated at Morichal. The oil comes from two producing zones, the more accessible being 12.8° API gravity and the other, 8.2° API gravity.

The crude will be heated to 300° F. before entering the desalter and will enter the pipeline at 185° F. Temperature recorders will be placed along the line to check temperatures. Crude is expected to reach the terminal at a temperature of 120° F. The desalter will reduce the sand and water content of the crude to not more than 1.5%.

The entire line, from Morichal to the Orinoco River approaches, will be laid aboveground. The uniform sandy soil will obviate the need for supports except in a few short sections. There are no road crossings and only one shallow stream on the route.

Terminal facilities. The terminal will also be equipped with a heater to lower the viscosity of the oil. It



MANIFOLD and two of three tanks in Marichal storage area. Opposed piston pumps at left are electrically operated.

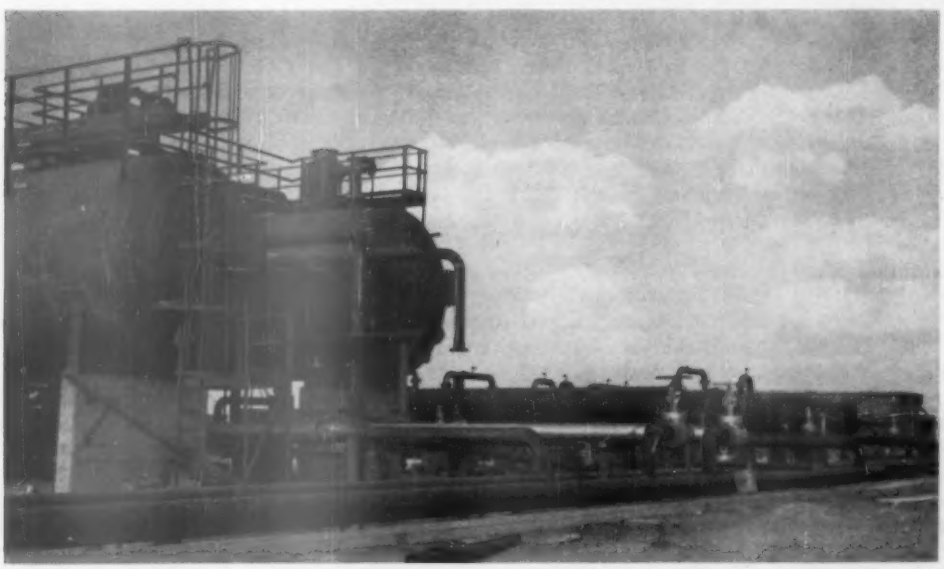
will be loaded on tankers at 160° F. The terminal will have two 150,000-bbl. tanks and a dock long enough to handle T-2 and somewhat larger tankers. The site is large enough to accommodate a plant which is under consideration for the future.

Storage at Morichal will consist of one 80,000-bbl. and two 55,000-bbl. tanks. The main pump station will serve the field as well as the pipeline. Gas engines, using gas from the field, will drive the four 1,320-kw. generators to provide electric power for pumping the wells, the pipeline pumps, desalter, etc.

Phillips has been developing Morichal field since January 1960. It has drilled 33 wells, all of them producers. Initial capacity of the line, 25,000 bbl., is sufficient for present production but its capacity can be increased to 50,000 bbl. with additional intermediate pumps and heaters. Its concession has 38 years to go and then the entire operation becomes the property of Venezuela.

The crossing was made under the supervision of Rex Hunter, senior project engineer, and E. M. Nobel, field engineer in charge.

Several contractors handled various parts of the job. They included Constructora Romanin, C.A., flow station, pump station and electric generating plant; Tellepsen's Petro-Chem Constructors, the crossing; Vern E. Alden Engineering & Construction Co., the approaches and terminal; Hermanos Licursi, the main line; Cemteca of Pto. Ordaz, the soundings, and Constructora Raymond, the probing, boring, and terminal dock.



DESALTER being assembled at Morichal will reduce salt and water content of crude to not more than 1.5% before entering line.

NEWEST PETROCHEMICAL PLANT at Signal Oil & Gas Co.'s Houston division refinery is a Hydeal. Feed stocks of hydrogen and toluene come from its cat reformers and aromatic extraction units.

How Signal's new Hydeal unit will

THE FIRST large-scale Hydeal unit to go on stream is at Signal Oil & Gas Co.'s Houston division refinery. Capacity is 1,100 bbl. daily of benzene.

Construction time was extremely short; only 95 days elapsed between ground breaking and the startup on January 2, 1961. Procon, Inc., a Universal Oil Products Co. subsidiary, was the contractor.

Signal takes the achievement in stride because it's the third time the Houston refinery has put on stream the first large-scale unit of a new process.

During 1951, the first UOP Platforming unit for aromatics production went on stream. Later that year the first Udex unit licensed by UOP started production.

Signal has added more petrochemical units since then and now converts a large portion of its crude-oil charge into more than 50 petrochemical products.

Hydrodealkylation fits neatly into Signal's processing scheme.

Signal saw the potential and signed a sales contract for benzene which it would derive from toluene. Initial product delivery was to start only 4 months after contract signing.

BY H. C. BOZEMAN
Gulf Coast Refining Editor

Signal licensed the hydrodealkylation (Hydeal) process for converting toluene into benzene from UOP. The Hydeal process is a joint development of UOP and Ashland Oil & Refining Co.

Initial delivery of benzene was made 1 week before schedule. Unit startup was smooth and initial production met customer specifications.

The Process

In the hydrodealkylation process side chains are stripped from aromatics. The equilibrium reaction is driven to completion in an excess of hydrogen which saturates open carbon bonds and cuts coke formation.

UOP's Hydeal process is versatile and can dealkylate a variety of aromatic feeds.

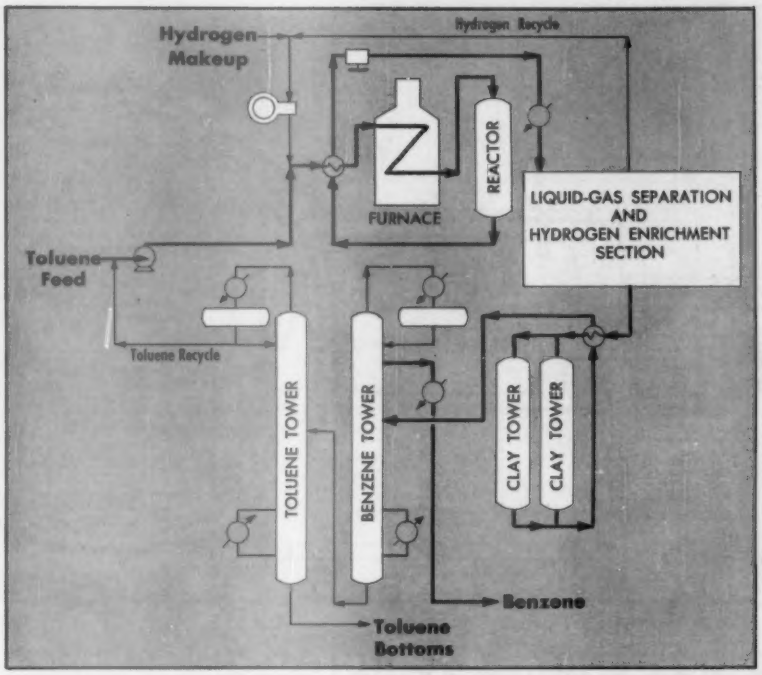
Should toluene become too expensive, Signal plans to continue making benzene by switching to xylenes and other heavier aromatics feed stocks. If benzene becomes less attractive the unit will be modified and, using a different feed stock, petroleum naphthalene will be made.

Signal's unit is divided into three sections: gas enrichment, reaction, and finishing.

Gas enrichment. Makeup hydrogen from the cat reformers is processed to remove impurities. The amount of hydrogen makeup is regulated by the amounts used in reaction and leaving the unit from the gas separation section.

Reaction. Recycle and makeup hydrogen are compressed to reaction pressure and mixed with fresh and recycle toluene feed before entering the preheat exchanger and fired heater. Reaction is accomplished in a fixed-bed downflow catalytic reactor. Signal has regenerated the catalyst in place and returned activity to design.

Reactor effluent preheats the feed and is cooled further before entering the liquid-gas separator and hy-



UNIT IS DIVIDED into three sections: Gas enrichment, reaction, and finishing.

convert toluene to benzene

Unit was designed to produce 1,100 bbl. daily. Thus far its performance has been on target. In the event toluene becomes too expensive, Signal plans a switch to xylenes and other heavier aromatics feed stocks.

drogen-enrichment section. Hydrogen-recycle gas enters the recycle compressor inlet.

Finishing. Liquid product is pumped through clay towers to remove color bodies and then is fed into the benzene tower. Benzene product is sent to storage. Uncondensed overhead gases from the benzene tower serve as reflux. A differential instrument controls benzene-tower tops.

Benzene-tower bottoms go into the toluene tower. Toluene recycle is the tops product and returns to the reaction section. Toluene-tower bottoms contain mainly biphenyls which freeze at ambient temperature. They are pumped to heated storage tanks through steam-traced lines and are blended into No. 2 oil.

Design. The unit was designed to produce 1,100 bbl. daily of 5.4° C.-solidification-point benzene and has had no difficulty in meeting performance requirements. The fresh charge is toluene and a small amount of unconverted toluene is recycled from the fractionation facilities back to the reactor charge.

Mechanical Features

Building a unit as complex as a modern-day refinery unit from ground breaking to production in only 95 days required close coordination among Signal, Procon, and the vendors.

The Hydeal unit is sandwiched in a 50 by 200-ft. plot between two other petrochemical units.

The project included some offsite tankage and piping. Also, feed stock and utility tie-ins were made.

Pile foundations support process equipment. Overburden soil was removed to the lowest depth that concrete would be placed. A pile driver moved in and started driving piles at one end of the site. When the pile driver emerged from the other end 169 piles had been driven.

Concrete foundations were formed and poured over the pile caps.

Equipment was lifted right off delivery trucks and set in place whenever possible. This procedure minimized storage and rehandling. Also, much of the equipment was sent from the vendor's plants by special truck to save time.

Process vessels arrived from as far away as Lockport and Joliet, Ill. Some other equipment came even greater distances.

Pipe was prefabricated and brought to the job site for erection. Piping is color coded. Also, hot lines are marked with distinctive colored tapes.

Pumps are conventional and are equipped with mechanical seals in process services.

Air-fan exchangers cool compressor lube oil and jacket water, and reactor product. Other exchangers are tubular and pipe-in-pipe exchangers, some of which have finned tubes.

Hot oil is the heat medium for reboilers.

Instruments are all electronic. Control room is shared with one of Signal's other units. A gas chromatograph in the refinery laboratory analyzes samples withdrawn from the process.

Compression requirements are met with two 400-hp., 6-cylinder V-angle-drive gas engines. A firewall separates driver and compressor ends.

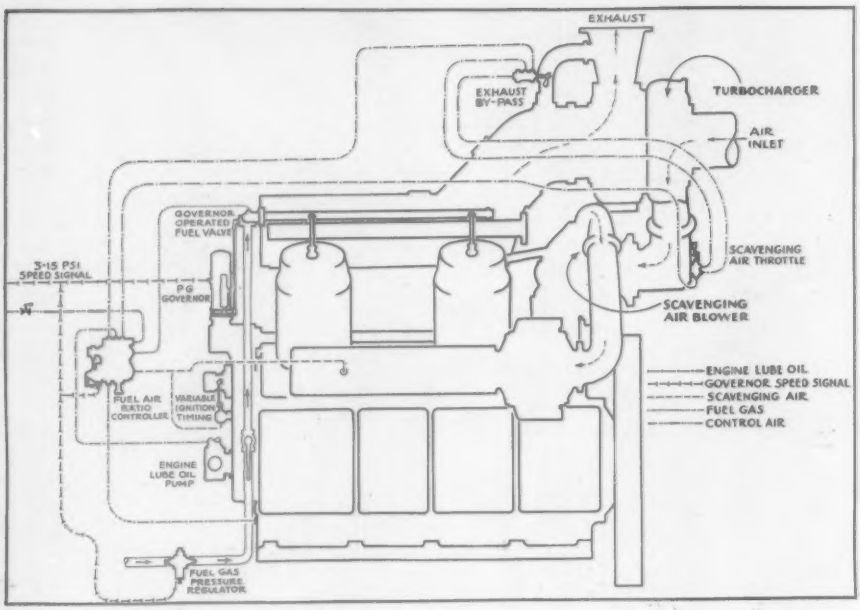
The compressors were built for maximum interchangeability and to cut the amount of stocked spare parts. For example, the diameter of two cylinders in each compressor is the same; capacity is changed with pockets.

Compressor cylinders are nonlubricated and have carbon rings.

Startup. A vacuum is pulled on the unit before startup to check for leaks and prevent loss of hydrogen during operation.

All tanks are gas blanketed to prevent any adverse effect air might have in the process and on the products.

VARIABLE SPEED-variable torque control for series turbocharged two-cycle gas engine. Fig. 1.



New fuel-air-ratio control system

—*for two cycle gas-engine compressors*

A FULLY PROVED variable-speed, variable-torque-control system for two-cycle gas engines has been made possible by an entirely new approach to fuel-air-ratio control. In this new approach, the system's nerve center is a fuel-air-ratio sensing controller—the same type of component already used for over 10 years on four-cycle gas engines.

Proper control of the fuel-air ratio on the two-cycle gas engine is a matter of maintaining proper scavenging-air flow through the engine and maintaining proper supercharging level within the power cylinders under all conditions of engine speed and torque load.

The higher horsepower of the turbocharged two-cycle engine is due to the increased amount of air trapped in the power cylinders at the beginning of compression. The more air available in the cylinders, the more fuel that can be burned, which results in more horsepower.

The quantity of air trapped in the power cylinders is related to scavenging-air flow and the pressure in the exhaust manifold. Supercharging the two-cycle engine requires sufficient exhaust-manifold pressure and sufficient scavenging-air flow for the horsepower to be carried.

Turbocharging. The turbocharger provides an excellent means of supercharging the two-cycle engine, since the turbine of the turbocharger controls the exhaust-manifold pressure and the turbocharger blower increases the scavenging-air flow for the increased horsepower. The relationship of exhaust manifold pressure and air flow to horsepower for any two-cycle engine is important. For example, high exhaust-manifold pressure without adequate scavenging-air flow will give inefficient combustion and rapid engine deterioration.

Series turbocharging used on the two-cycle gas engine has a scavenging-air blower driven by the engine crankshaft which is in series with the turbocharger as shown in Fig. 1. This combination of turboblower and engine-driven blower has the capability of giving the correct quantities of scavenging-air flow and correct manifold pressure for most efficient operation-regardless of ambient temperatures, engine speed, and engine-torque output.

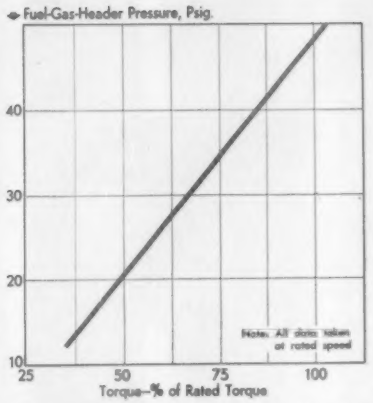
Due to the inherent flexibility of series turbocharging, engines so equipped can be tailored for smooth operation at wide ranges of speed and torque. There is not at this time a pure turbocharged two-cycle engine with this range of flexibility, and it is quite apparent that effective fuel-air-ratio control would be extremely difficult to achieve on a unit depending solely upon its turbine for scavenging air to the power cylinders.

BY WARREN A. RHOADES, JR.

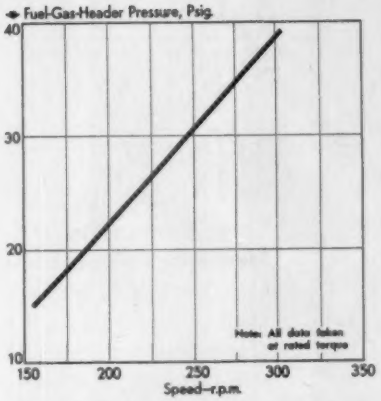
. . . design engineer in Cooper-Bessemer Corp.'s development division, Mount Vernon, Ohio. He is a graduate of Louisiana State University with a bachelor of science degree in mechanical engineering and is a registered professional engineer in the State of Texas.

Torque measurement. The controlled operation of the turbocharged two-cycle engine at reduced torque requires the proper control of the supercharging pressure level and control of the scavenging flow in proportion to the torque being carried by the engine. To control this, it is necessary to sense the torque on the engine at any given speed.

One such sensing point is the fuel-gas pressure being applied to the individual power cylinders. This fuel-



FUEL-GAS-HEADER pressure as function of torque for two-cycle gas engine. Fig. 2.



FUEL-GAS-HEADER pressure as function of speed for two-cycle gas engine. Fig. 3.

gas pressure is controlled by the main engine governor and varies with engine torque at constant speed. The relationship of fuel-gas-header pressure to torque is shown in Fig. 2.

Since the fuel-gas-header pressure is proportional to torque, the scavenging-air pressure can be controlled in proportion to torque at a constant speed by controlling the scavenging-air pressure in proportion to the fuel-gas-header pressure.

The gas-header pressure also varies with engine speed at constant torque as shown in Fig. 3. In order to use the fuel-gas-header pressure as an indication of torque at variable speed, it is necessary to modify the fuel-gas-header-pressure signal as the engine speed changes.

The fuel-air-ratio controller is the device which senses the gas-header pressure, modifies it for speed, and then regulates the scavenging-air pressures in proportion to the sensing signals. The fuel-air-ratio controller does not actually move the valves directly to control scavenging-air-pressure level, but simply operates a hydraulic pilot valve.

The hydraulic pilot valve is connected to the pressure-control valves by oil lines. The hydraulic fluid is the engine lubricating oil taken from the lube-oil-pressure supply to the engine.

Key valves. Physically the scavenging-air-pressure level is controlled by an exhaust bypass valve which bypasses the turbocharger exhaust turbine, and an air throttle valve which restricts the air flow from the turbocharger blower discharge. The exhaust bypass basically controls the supercharging level and the air-throttle valve controls the scavenging-air flow.

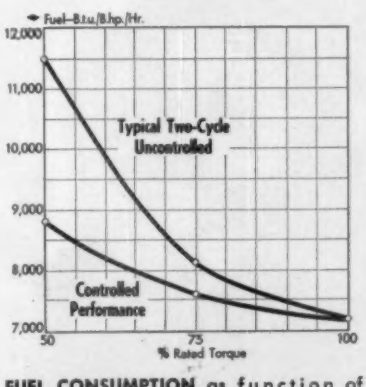
Both of these valves, the exhaust bypass and the air throttle, are actuated by separate hydraulic double-acting cylinders. The two hydraulic cylinders are interconnected so that the air throttle valve has to be wide open before the exhaust bypass can begin to close, and conversely, the exhaust bypass has to be fully open before the air throttle can begin to close.

In operation the action of the controls is such that on a reduction of torque the exhaust bypass begins to open first. As the torque is reduced further, the exhaust bypass continues to open until it is wide open which desupercharges the engine. Further reduction in torque causes the scavenging-air throttle to begin to close which partially descavenges the engine. By proper control of these actions smooth combustion is obtained down below one-half torque.

On increase in torque from the low torque condition, the scavenging-air throttle begins to open which increases scavenging-air flow. Further increase in torque causes the air throttle to fully open for full scavenging-air flow. After the scavenging-air throttle valve is wide open, any further increase in torque causes the exhaust bypass to begin to close which begins supercharging the engine for the higher torques. At 100% torque the engine is fully supercharged with full scavenging air flow.

Basically, there is only one control for variable speed at full torque. That is a variable timing control which retards the ignition timing for the low-speed condition. The slower the speed the more retarded the timing, the faster the speed, the more advanced the ignition timing.

At operating conditions of variable torque with variable speed both the controls for variable speed and variable torque work together for optimum combustion.



FUEL CONSUMPTION as function of rated torque, controlled and uncontrolled operation. Fig. 4.

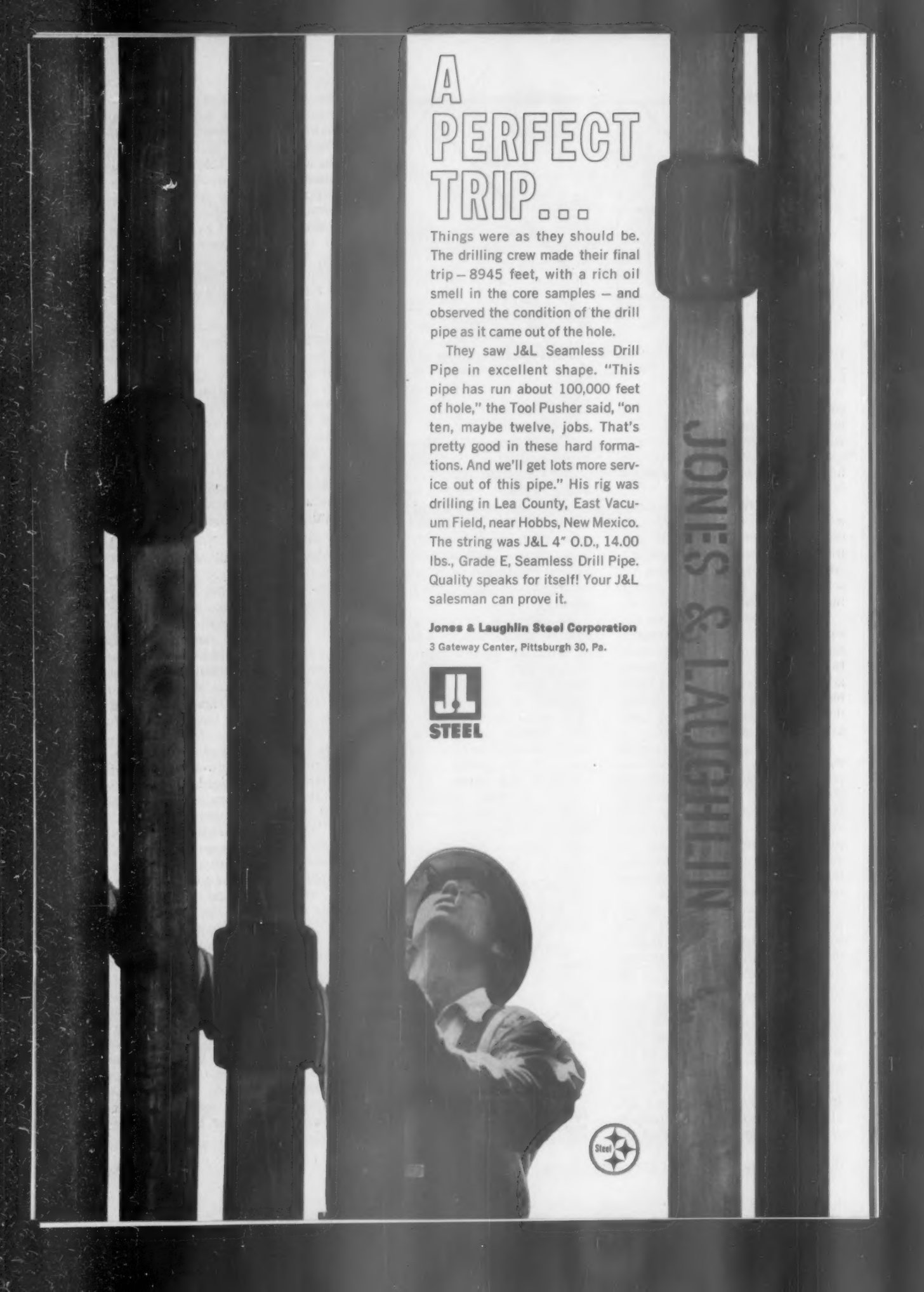
Fuel economy. The coordinated combination of all of the controls on the turbocharged two-cycle engines has the capability of giving maximum fuel economy consistent with good engine operation throughout the complete range of 110% torque to 50% torque and 100% speed to 50% speed and at any combination of the above.

Fuel-economy improvements are clearly shown on the specific fuel-consumption curves for both variable speed and variable torque. Fig. 4 shows the improvement in fuel consumption obtained with the controlled engine when compared with the standard noncontrolled engine.

A general reduction of brake specific fuel consumption is obtained throughout the entire torque range from 100% torque to 50% torque.

At a combination of 50% speed and 50% torque, equivalent to only 25% load, there is an appreciable drop in the fuel consumption indicated in the controlled performance curve, Fig. 4.

Not only does the controlled operation of the turbocharged two-cycle engine give excellent fuel consumption at lower torque and speeds, but the fuel-air-ratio control also results in consistent firing, optimum combustion, uniform peak firing pressures, and uniform exhaust temperatures between power cylinders.



A PERFECT TRIP...

Things were as they should be. The drilling crew made their final trip – 8945 feet, with a rich oil smell in the core samples – and observed the condition of the drill pipe as it came out of the hole.

They saw J&L Seamless Drill Pipe in excellent shape. "This pipe has run about 100,000 feet of hole," the Tool Pusher said, "on ten, maybe twelve, jobs. That's pretty good in these hard formations. And we'll get lots more service out of this pipe." His rig was drilling in Lea County, East Vacuum Field, near Hobbs, New Mexico. The string was J&L 4" O.D., 14.00 lbs., Grade E, Seamless Drill Pipe. Quality speaks for itself! Your J&L salesman can prove it.

Jones & Laughlin Steel Corporation
3 Gateway Center, Pittsburgh 30, Pa.

J&L STEEL

Some sour natural-gas streams can be economically sweetened by using

Selective adsorption to remove H_2S

BY DON W. RUSHTON
AND WENDELL HAYS
Canadian Equipment Sales & Service Co., Ltd.,
Edmonton, Alta.

NATURAL-GAS STREAMS high in CO_2 content and with H_2S content up to about 3% are good candidates for dry-bed selective adsorption using calcium alumino silicate. When CO_2/H_2S ratios of above 3:1 are found, this system shows a considerable economic advantage over conventional amine equipment.

The system described in this article has been in service near Edmonton, Alta., for about a year. The installation cost was about $25,000, including desiccant, and operating costs have been estimated at 0.7 cents per M.c.f. at design flow rate. The operating costs included loss of flared regeneration gas, operator's salary, and complete change of desiccant bed each year.

Basic Gas Stream Requirements

1. H_2S content should be approximately 3% or less for conventional system design.

2. CO_2/H_2S ratio should be greater than 3:1, thereby making questionable the economic use of amine equipment.

3. Water content should be below 20 lb./M.M.s.c.f. for most efficient H_2S adsorption. To meet this requirement it may be necessary to use upstream dehydration units.

4. Gas-feed pressure should exceed downstream system pressure by at least 50 psig. for efficient regeneration.

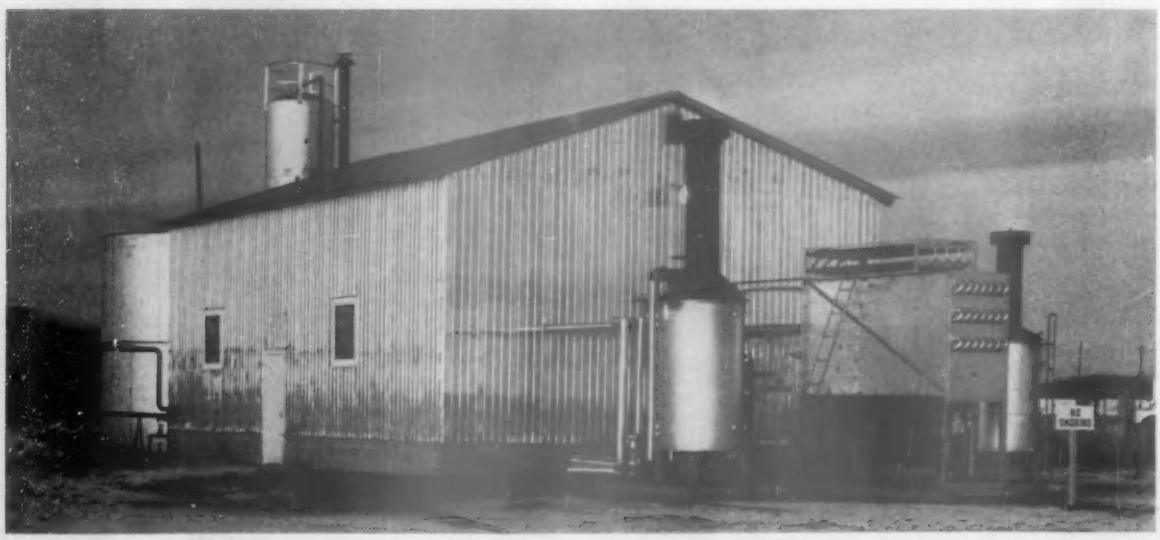
Process-Flow Description

Referring to the accompanying flow diagram, it can be seen that the system closely resembles the open-cycle type of dry-desiccant hydrocarbon - recovery plants, the prime difference being in control of regeneration gas flow. Main flow enters tower 1 through valve F1, is sweetened to specification by the adsorbent, and passes through valve F2 to market line. A fixed volume of sweet regeneration gas is pinched off the main flow by valve R1 which is regulated by the differential-pressure controller in the regeneration-gas line. Regeneration gas is heated by a direct-fired line heater, then is directed by valve R2 into tower 2. Regeneration gas passes through the saturated adsorbent bed, through valve R3, and then either rejoins the main flow to market or is diverted to flare by valve R4. The position of valve R4 is controlled by the pneumatic temperature controllers C1 and C2.

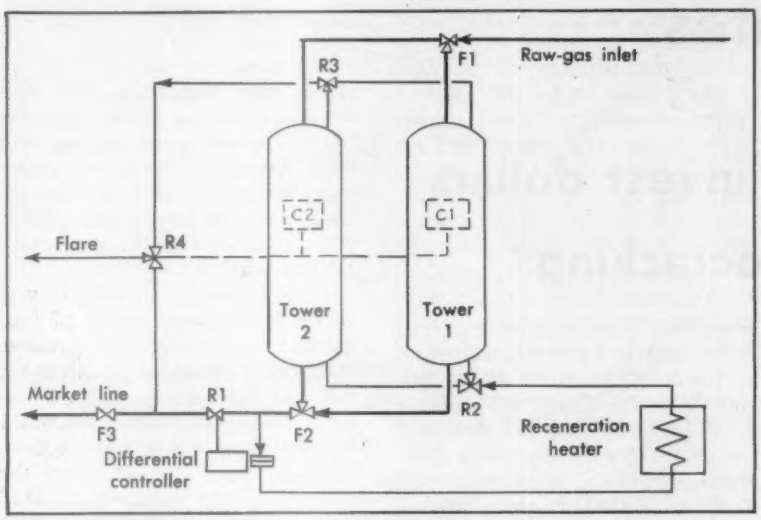
Regeneration flow continues to

TABLE 1—RESULTS OF TESTS USING DAVISON MICROTRAPS NO. 5A, 1/16-IN. PELLET

Regen. cycle hours	Oper. pres. (psi.)	Inlet temp. (°F.)	H_2S conc. gr./100 s.c.f. inlet gas	H_2S conc. gr./100 s.c.f. sales gas	Regen. temp. (°F.)
3	500	95	28	0	750
4	500	100	25	0.25	700
6	500	95	30	0.65	700
3	500	95	25	3.0	600
3	500	95	26	1.0	650
3	500	95	25	0	750



SELECTIVE ADSORPTION UNIT was considerably cheaper to install and operate on this location than a conventional amine plant.



MAJOR DIFFERENCE between this system for removing H_2S and the dry-desiccant hydrocarbon recovery unit is in the control of regeneration gas flow.

the market line until the temperature of the adsorbent bed becomes high enough to drive off the adsorbed H_2S and contaminate the flow; at this point valve R4 diverts the gas to flare. The regeneration cycle continues with the heater off until the bed cools below the drive-off temperature (approximately 150°) of the H_2S at which time R4 again routes regeneration gas into the market line.

Operating Data

(Although the system was designed for 5 M.M.c.f.d. throughput, the maximum flow to date has been 1.5 M.M.c.f.d. due to market requirements.)

Flow—1.5 M.M.s.c.f.d.

H_2S concentration—inlet, 25 grains per 100 s.c.f.; outlet, no trace on Tutweiller and MSA sniffer.

Cycle time—3 hours (1 heat, 2 cool).

Regeneration-gas temperature—750° F.

As maximum flow tests could not be made, the cycle time was increased from 3 hours to a maximum of 6 hours (see Table 1) in order to check the adsorption capacity of the beds. At the end of the 6-hour cycle outlet H_2S concentration was 0.6 grains per 100 s.c.f., well below pipeline requirements. At a flow of 1.5 M.M.s.c.f.d., the adsorption capacity was 7.56% by weight; this is considerably greater than was expected as the design figure was 2 weight %, admittedly conservative. An explanation for this higher capacity may be found by considering the low (0.5 mole) CO_2 content of raw gas; adsorptive displacement of H_2S by CO_2 is apparently slight at low H_2S/CO_2 ratios.

Operating pressure of the system is 450 psig. This pressure was chosen to take advantage of the maximum adorptive capacity found by Fails and Harris.[1] In this case pipeline delivery pressure was low enough to allow use of this optimum.

To regenerate, 4.2 M.c.f./hour of sweet dry gas is heated to 750° F. by a direct-fired heater rated at 450,000 B.t.u./hour. Regenerative temperature was raised from 650° to 750° F. as the lower temperature did not completely clear the beds and H_2S contamination occurred toward the end of the 3-hour cycle. No residual carryover was found with 750° gas entering the beds. Peak temperature in the beds is 650°-700° F.

At low flow of 1.5 M.M.c.f.d., regeneration gas required is 6.5% of the daily throughput; at design flow rate, however, this figure drops to 2% as the volume of regeneration gas is a function only of the thermodynamic properties of the towers and the adsorbent. Approximately 65 M.c.f.d. is contaminated and driven off to flare. A volume tank installed in the flare line diverts some of the flare gas to the regeneration-gas heater, and to a heater in the operator's office. Actual loss to flare is estimated at 25 M.c.f.d.

Design Consideration

Although the manufacturer's data show adsorptive capacities of the adsorbent up to 15 weight % under ideal conditions, 2% was used for design due to the lack of data pertaining to operation of this material under field conditions.

An original well analysis of the gas showed an H_2S content of 12.5 grains per 100 s.c.f. This figure increased to 25 grains per 100 s.c.f. after the system began operation.

Tower sizing was originally based on 12.5 grains at 5 M.M.c.f.d. on an 8-hour cycle. For complete scrubbing, each bed was required to remove 29 lb. of H_2S per cycle. At 0.02 lb. H_2S adsorbed per pound of absorbent, the bed weight required was approximately 1,500 lb. Adsorption towers are 30 in. by 10 ft. by 600 psi. w.p., giving a resultant gas velocity through the bed of 0.35 ft. per second and a contact time of about 23 seconds.

The system has not been in operation long enough to allow compilation of aging data, although, to date no decrease in adsorptive capacity has been noticed. The adsorbent used (5-4 microtraps—Davison Chemical Co.) was found to be quite rugged. Due to failure of an upstream level controller the entire system was loaded with a heavy crude emulsion and remained saturated for 2 days before it could be regenerated. A number of regeneration cycles were run with bed peak temperatures being increased from 350° to 800° F. in approximately 75° increments; samples of the material were tested by the manufacturer and although considerable residual hydrocarbon was found, the H_2S adsorption rate was not affected noticeably and there was no physical damage.

While this process is without doubt quite limited in application it certainly looks promising enough to justify careful consideration for low H_2S content scrubbing.

Acknowledgment

The authors express appreciation to Davison Chemical Co. for its cooperation and helpfulness in this venture.

Reference

1. Harris, W. D., and Fails, J. C., "Sweetening Natural Gas by Selective Adsorption," The Oil and Gas Journal, July 11, 1960, p. 86.

Processing notes

Refiners slow to invest dollars in versatile hydrocracking

HYDROCRACKING has found a warm place in refiner's hearts but hasn't yet succeeded in opening many wallets. Large use of it will come when present crude-still overcapacity is used up and gasoline-to-distillate ratio is higher.

These are the reasons most often cited for the lack of a big rush to board the hydrocracking bandwagon. There are other reasons, of course, such as the cost of supplemental hydrogen. But without a market for more gasoline the payout isn't there.

Hydrocracking so far has been installed in widely scattered locations. Two commercial units and a pilot unit are on the West Coast. Here, the gasoline-to-distillate ratio definitely is rising.

Powerine Oil Co. has a 2,200-bbl.-daily hydrocracker on stream (OGJ, Aug. 14, p. 95), Tidewater Oil Co. is building a 20,000-bbl.-daily unit at Avon, Calif. (OGJ, May 8, p. 69), and Standard of California, Western Operations, Inc., has a 1,000-bbl.-daily pilot unit at Richmond, Calif.

East of the Rockies, two units are being built. Standard Oil Co. (Ohio) is building a 7,500-bbl.-daily unit at Toledo (OGJ, April 24, p. 79), and Apco Oil Corp. will build a 2,950-bbl.-daily unit at Arkansas City, Kans. (OGJ, July 31, p. 112). Standard Oil Co. (California) will have a 17,000-bbl.-daily hydrocracker at its proposed refinery at Pascagoula, Miss. (OGJ, Aug. 28, p. 48).

It appears so far that hydrocracking must fit a unique situation judging from the locations and number built or being built.

It is rumored that one refiner or another soon will announce a hydrocracking project, but they haven't been verified.

One thing is sure, however. All refiners are taking a deep, serious look at hydrocracking. Evaluations are thorough and comprehensive.

Refinery simulation by linear-programing techniques have speeded these studies. Thus, most refiners have a good idea of when conditions will favor hydrocracking for them.

New hydrocracking data and market projections are inserted into the programs to keep the studies current.

Hydrocracking units already installed must compete against existing cat crackers. Grass roots refineries present hydrocracking with more favorable conditions. However, the number of grass-roots refineries will be low in the next few years compared to the number of existing refineries.

Hydrocracking's versatility is shown in the wide variety of feed stocks it can convert into gasoline. It originally processed gas oils in the 600° to 700° F.e.p. range. These feed stocks may indeed be where hydrocracking will be needed most.

Later runs have extended the end point both directions to 855° F.e.p. on the high side (OGJ, June 19, p. 112) and to 58°-API-gravity distillates on the low side (OGJ, Apr. 17 Newsletter).

Hydrocracking will be justified when there is a high gasoline-to-distillate ratio. The economics need to be examined at each refinery.

Home-heating oil faces long-term competition from natural gas. The shift will decrease heating oil's share of products from crude oil even though total volume increases. Gasoline will increase both its share and volume.

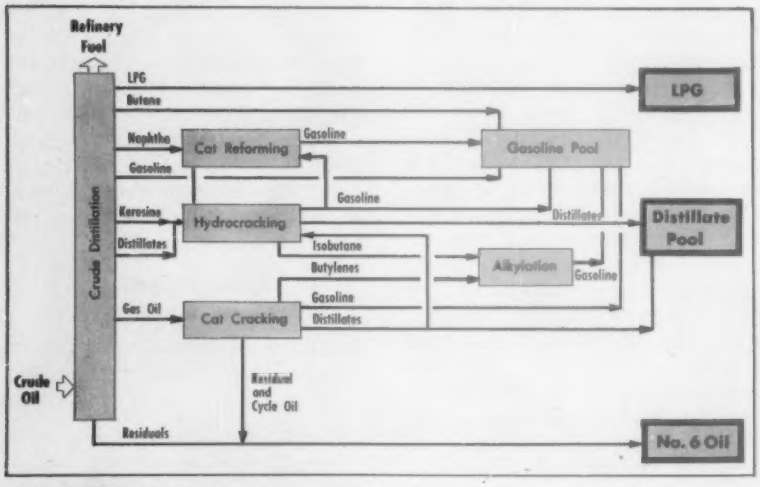
Existing refineries expect a combination of cat cracking and hydrocracking in the future. Heavy stocks will be cat cracked and other stocks will be hydrocracked. Refiners don't expect hydrocracking to replace cat cracking.

Refineries that are cat cracker limited may be the first to install hydrocracking. But high recycle rates on cat crackers will make it more difficult to install hydrocracking. Some refineries will tend to heavier crudes which will overload cat crackers and unbalance yields.

Hydrocracking upgrades more of the feed into gasoline than does cat cracking.

Processing scheme for fuel refineries in the future may be crude distillation, cat cracking, hydrocracking, cat reforming, and alkylation.

Cat cracking will upgrade heavy products into gasoline and distillates. Hydrocracking will upgrade distillates into gasoline. Existing cat reformers will upgrade hydrocracker gasoline and so will fit nicely into the processing scheme. Alkylation



HYDROCRACKING is a cracking and hydrogenation process that also makes isomers and aromatics.

will use the isobutane from hydrocracking and olefins from cat cracking.

Present cat reformers will supply hydrogen for hydrocracking. Cat reformers kept refiners in the octane race which has subsided some now. Refiners can balance cat reformer severity and lead additions to minimize costs.

Cat reforming is an aromatization process to remove hydrogen from napthene rings and make benzene, toluene, etc. which have a higher octane. Hydrocracking is a cracking and hydrogenation process and also makes isomers and aromatics.

Hydrocracking is a more expensive process than cat cracking because of higher operating pressures and handling of hydrogen.

Hydrogen supply is a big question mark for hydrocracking, especially supplemental hydrogen. Hydrocracking is cheaper than building a cat cracker as long as hydrogen is available, for example from cat reforming. But whenever a hydrocracker needs supplemental hydrogen, then a new cat cracker is less expensive.

Hydrogen usage may vary from about 1,300 to 2,500 std. cu. ft. per bbl. depending on hydrocracker feed stock and operating conditions. Present cat reformers may not be able to supply such a wide variation without sacrifice in hydrocracker throughput.

Hydrogen-plant investment is especially high in the smaller sizes. Also, large quantities of hydrogen haven't yet been demanded.

A ready source of low-cost hydrogen over and above that available from cat reforming may open the road to wide adoption of hydrocracking.

Fast oil drain speeds changing

FAST OIL-DRAIN system developed by Standard Oil Co. (Ohio) in conjunction with Aro Equipment, of Bryan, Ohio, is the latest device for the convenience of the motorist when he has his automobile serviced.

A special oil-drain plug replaces the usual drain plug on the bottom of the engine. A metal tube attached to the plug is bent to reach up under the hood where the end is fastened in a convenient place for applying the nozzle of the vacuum equipment to suck out the oil for a complete drain. This drain oil is run into a transparent plastic tank calibrated to measure the drained oil within sight of the customer.

The vacuum unit is designed so that it can also be used with a flexible plastic tube to insert in to the dip-stick hole to extract the oil from a car not equipped with the permanent special drain plug and metal tube installation.

Several hundred customer cars have been equipped with the special drain plug and the new equipment has been under test at several specific Sohio stations during the past six months.

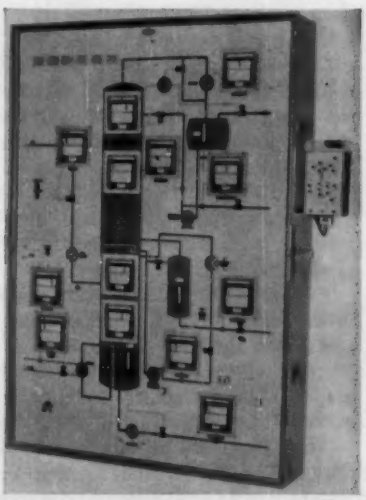
ALL OIL can be drained in 35 to 40 seconds without putting the automobile on the service-station lift.

Realistic dummy panel gives trainees practice in column control

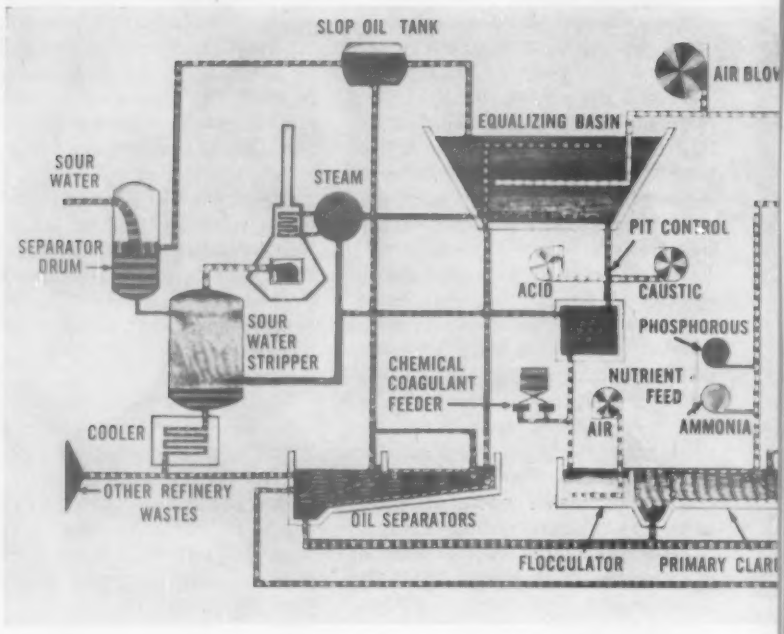
NEW TRAINING aid permits operators to practice all phases of fractionation-column control under realistic conditions but in complete safety.

The device, made by Carmody Corp., of New York, is a full-scale unit that both looks and behaves like the panels used to control fractionation columns. With a remote-control console, an instructor can cause instruments on the trainer to simulate realistic changes in operating such as might occur during start-up or shutdown, or with changes in feed, or loss of pressure. The trainee can then take the necessary actions on the trainer to control or correct the operation. If he makes a mistake, alarms automatically go off as in an actual control room.

This allows the instructor and trainee to have a continuous and close check on trainee's proficiency and on his ability to react correctly under emergency conditions.



OPERATORS CAN PRACTICE all phases of fractionation-column control in complete safety.



This return-water treatment is declared to be so effective, a slip strea

How Cities Service instrumented it

BY KENNETH G. SEABRIGHT
Technical Director
Cities Service Refining (Canada) Ltd.
Bronte, Ont.

WATER STREAMS leaving the Cities Service refinery at Bronte, Ont., are divided into two major streams. These are storm - water drainage from uncontaminated areas and the combined process and sanitary flows.

Storm water is collected by a system of open ditches and underground piping from areas that normally can not be contaminated with oil. Storm water is not normally treated. It is simply passed through two parallel API oil-water separators then flows to a surge lagoon, from which it flows by gravity directly to Lake Ontario. The oil separator is simply a precaution. If it is ever contaminated, the flow can be diverted to the treating plant.

Process water is collected from all process and tankage areas and combined with the sanitary flows. From here the wastes pass through a flume before being charged to two parallel oil separators.

This flume is a peculiarly shaped open channel designed so that as the quantity of water flowing changes the depth of water changes, too. The difference in level through this flume is measured by the back pressure required to keep air just bubbling through a tube that dips to the bottom of the channel. This pressure is converted to conventional 3-15-psig. pneumatic signals and transmitted to the control room where it registers as the flow to the separator on a recording flowmeter.

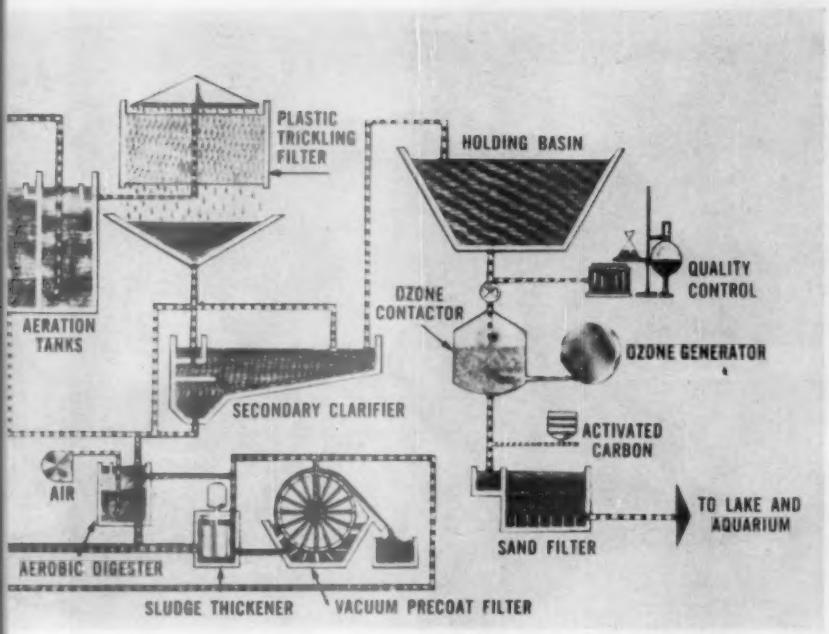
This signal also operates an automatic sampler located in the effluent from the oil separators. A small sample is scooped up from the stream of waste running continuously through the instrument and dumped into a 1-gal. bottle. The bottle is maintained by refrigeration between 4° and 10° C. The sample, collected over 24 hours, is analyzed for the contaminants to be removed.

Flow through the separators is controlled by fixed-level outlet weirs. In the separators, mechanical flight scrapers move the oil along the surface toward adjustable slotted skimmer pipes. At the same time, the scrapers move sludge in the opposite direction along the bottom to sludge-collection hoppers. Sludge is removed once or twice per day by a hand-controlled steam reciprocating pump and returned to the sludge-thickener tank.

Oil flows from the skimmer pipe to a sump which is divided into two sections by a weir. In the first section oil separates from the water and spills over the weir into the second section, which is an oil-collection sump. Water is pumped off from the first section, the flow being controlled by an interface-level float activating an on-off switch on the pump. Water returns to the oil-separator inlet. Similarly, oil is pumped off from the second section of the sump and returned to the wet-oil tank.

Equalizing basin. Waste water flows by gravity to the equalizing basin and enters through a line with multiple openings which distributes the flow uniformly over the entire basin. This basin is large enough to take a full day's flow of water,

Presented at ISA's summer instrument-automation conference, Toronto, Ont., 1961.



s taken to an aquarium stocked with various kinds of local game fish ↑

waste-disposal system at Bronte refinery

and is equipped with steam and air pipes for heating and mixing the waste.

Air enters through headers along the bottom. It is metered in the control room, but controlled by a hand-control valve located near the basin.

Heating is required only to prevent freezing in the winter. Steam to the distribution pipes in the basin is controlled by a TRC which receives a signal from a vapor-activated temperature element in the basin.

From the equalizing basin water flows to a feed-pump sump which is equipped with a level switch to cut off the pumps in the event of a low level. These raw-waste feed pumps discharge to waste-water heaters where the stream is brought to about 90° F., the most suitable temperature for the treatment process.

Flow is controlled by an FRC which is also equipped with high and low-level alarms. The primary element in this case is a venturi. The signal from the FRC positions an air-operated valve in the pump-discharge line, controlling the flow.

In the heaters, water temperature is controlled by a temperature recorder-controller equipped with high and low-level alarms. The signal from this TRC actuates an air-operated valve on the steam-outlet line from the heaters.

Flocculator-clarifier units. Waste next flows to flocculator-clarifier units. On its way it picks up flocculating chemical.

The pH is automatically controlled by a pH recorder-controller with the sensing element located in the feed line to the flocculators immediately beyond the point where chemical is added. A small stream of waste water is withdrawn and passed through a chamber, completely submerging the electrodes and thermocompensator. A glass electrode is used together with a pressurized silver-silver chloride reference electrode. The thermocompensator automatically corrects for temperature.

The electrodes are connected to a high-impedance d.c. voltmeter. The signal is amplified and the output fed to an electropneumatic transducer. Output from this is the actuating pressure for two pressure switches which operate a high and low-pH alarm. This output is also connected to a board-mounted recorder-controller with proportional and automatic reset.

The set point is set for a particular pH and the controller output is connected to two variable-speed pneumatically controlled pumps. One operates between 3 and 9 psi. and pumps sulfuric acid; the other operates between 9 and 15 psi. and pumps caustic.

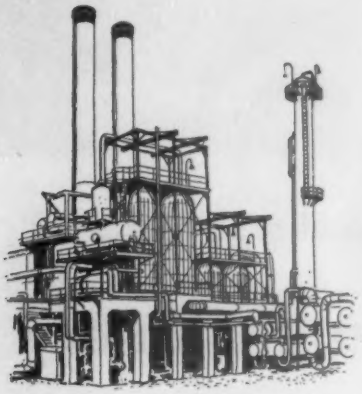
Flocculating chemical is stored in a bin and fed by a controlled feeder to one of two mixing tanks. In the flocculators the waste is mixed by air. This air, which is metered and recorded in the control room, is supplied by low-pressure air blowers. The flocculating chemical breaks up the oil-water emulsions, joins with the oil to form heavy particles or floc, and also coagulates the fine particles in the waste.

From here water passes through perforated dividers into the primary clarifiers. Waste is skimmed automatically by a mechanical collector

on stream in Japan

ANOTHER

HOUDRIFORMER



Nippon Mining Company, Ltd.
Mizushima, Japan

Largest in Japan when it went on stream, this new Houdriformer for Nippon Mining Company has a design capacity of 6,000 BPSD of 95 clear octane gasoline from high-paraffin, high-sulfur naphthas derived from Middle East crudes. The unit uses Houdry platinum reforming catalyst.

Other petroleum refiners in the U.S. and abroad have developed new flexibility and economy for their refining operations through HOUDRIFORMING. You may too. Complete information is available from:

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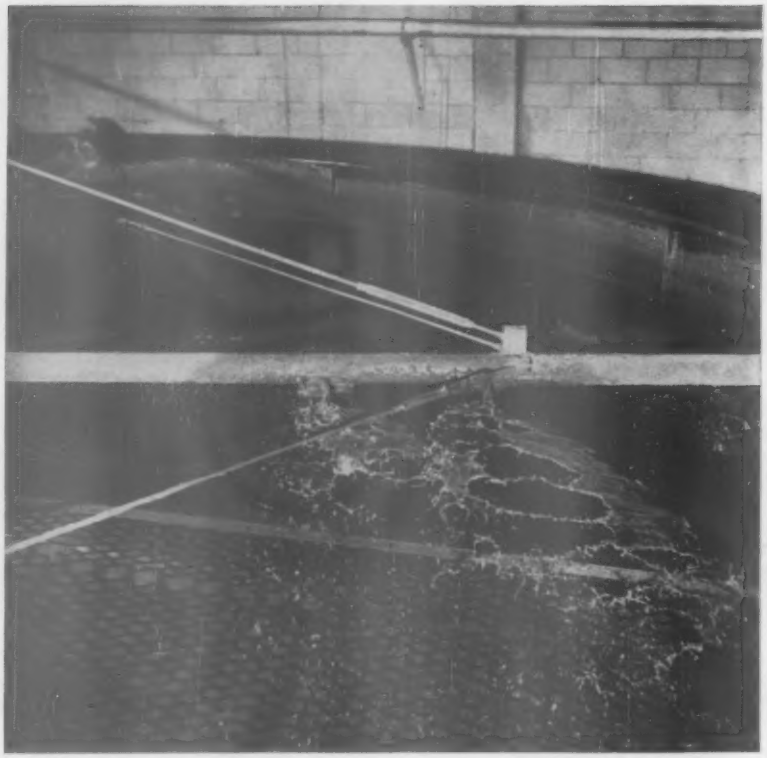


PLASTIC TRICKLING FILTER, because of its configuration, can be used up to 20 ft. in depth. This cuts the amount of surface area required. And there have been none of the plugging problems so frequently found in rock-type filters.

which also pushes the sludge to a sump at the head of the tank. Discharge of the sludge from this sump is controlled by a control valve receiving its signal from a timer. It opens for 1 minute in every 10. Scum from these primary clarifiers is withdrawn by a slotted skimming pipe located at the end of each tank and drains to the scum pump.

Aeration tanks. Effluent from the primary clarifiers flows through a trough to the primary aeration tanks, where the waste water is violently agitated with air. It is in these tanks that the bacterial action takes place. Phosphoric acid is drip fed to the trough which feeds the aeration tanks.

Return sludge is also delivered to these tanks. It enters at three points through pipes, located along the tank length, which dip beneath the rolling waste.

Since bacterial action takes time, secondary aeration tanks have been provided to take care of overflow from the primary tank. Air to both primary and secondary tanks is metered and recorded.

Filter. Effluent from the secondary aeration tanks drains to a sump where it is picked up by filter-feed pumps and discharged to mechanically revolving perforated pipes on the top of two Dow-Pac filters.

These filters consist of two cylindrical vertical tanks filled with vertical sheets of corrugated plastic over which the waste is distributed. Bacterial slimes adhere to the plastic sheets. As the waste passes over the bacteria they absorb most of the remaining chemicals, particularly the phenols.

Flow to each filter is controlled by hand-control valves and measured by flow indicators.

From the filters, waste water flows through a trough to a sump. Part of the waste is recycled over the filters to increase the contact time between slimes and waste. The remainder is sent to the scondary clarifiers.

Secondary clarifiers. In these large rectangular tanks, solids and bacteria settle to the bottom and are scraped to hoppers at the inlet end. Floating material is pushed by skimmers to a slotted skimming pipe near the outlet end. Clear waste water overflows into a trough and is sent to the holding basin.

Sludge. The floating material skimmed off both the primary and secondary clarifiers is fed to a scum sump. The heavy material taken off the bottom of the primary clarifiers is sent to the sludge sump. The scum sump drains to the sludge sump which in turn is pumped to the sludge-thickener tank. Level switches in these sumps automatically control the on-off action of the transfer pumps.

In the sludge-thickener tank the sludge is stirred gently to release trapped water. The thickener concentrates the sludge from about 1% to about 6% solids. Clarified effluent returns to the oil-separator inlet.

The thickened sludge is pumped to a rotary vacuum filter. This pump is air-powered and automatically controlled either by a signal from the level controller on the rotary filter, or by an automatic timing device. This device can be controlled pneumatically from the level controller, too, or it can be manually set.

The sludge that has settled in the secondary-clarifier tanks passes to another sump—the return-sludge sump. From here the sludge is picked up by an air lift pump to a box from which the flow can be divided into two streams. The flow of these streams is controlled by adjustable notched plates.

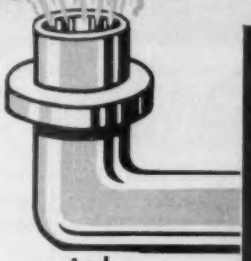
One stream from this division box carries the sludge to the primary aeration tanks. This stream insures that there is enough bacteria in the tanks to handle the incoming waste. The amount of sludge returned to the aeration tanks is metered by a bubble tube and stilling well in the division box, and recorded.

If there is too much bacteria for the incoming waste, a second stream is sent from this division box to the aerobic digester. These are simply aeration tanks where the sludge is constantly mixed until the bacteria dies from lack of food. Dead bacteria settle to the bottom and are conveyed to the sludge sump where they are mixed with sludge from the primary clarifiers and scum skimmers.

Holding basin. From the secondary clarifiers water flows directly to one of three holding basins. The stream is sampled automatically on the way and the 24-hour com-

STOP NOISE

WOMP WOMP WOMP



From AIR, STEAM and other GAS DISCHARGES

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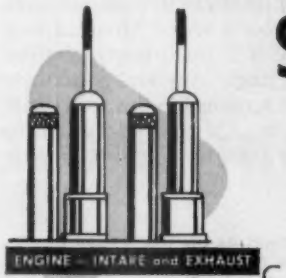

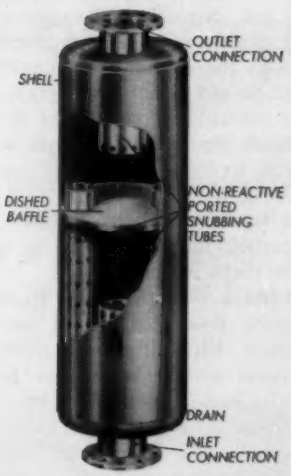

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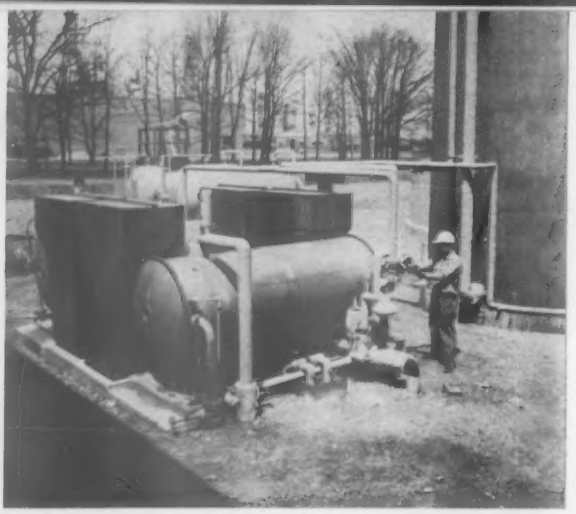
ACTIVATED CHARCOAL is added through these two units to decolorize and brighten the effluent. If ozone treatment fails, charcoal can also be used to remove phenols.



OZONE IS GENERATED in this cylindrical drum and mixed with water in the tank shown at right. Because of high requirements on effluent quality (15 p.p.b. of phenols), this step is necessary to oxidize residual phenols.

posite sample is analyzed for phenol. If this proves too high, the water can be recycled.

Ozone reactor. From the holding basin, water drains to the sand-filter feed-pump sump where it is picked up and discharged to the ozone reactor. The pumps are safeguarded by low-level switches, and the flow to the reactor is controlled by a flow controller recording in the control room.

Water is fed to the top of the reactor and distributed through a perforated pipe. Ozone is bubbled up through the downflowing liquid and oxidizes any remaining phenols. A level controller controls the effluent from the reactor as well as being able to override the FRC on the influent.

After treating with ozone, activated carbon may be added as a final absorbent for phenols.

Sand filters. Water effluent from the reactor flows to one of two sand filters. Effluent from these filters flows to the lake. Flow to the sand filters is controlled by a level controller which actuates an air-operated valve in the feed line. When the level in the filter in use rises, it is time to backwash.

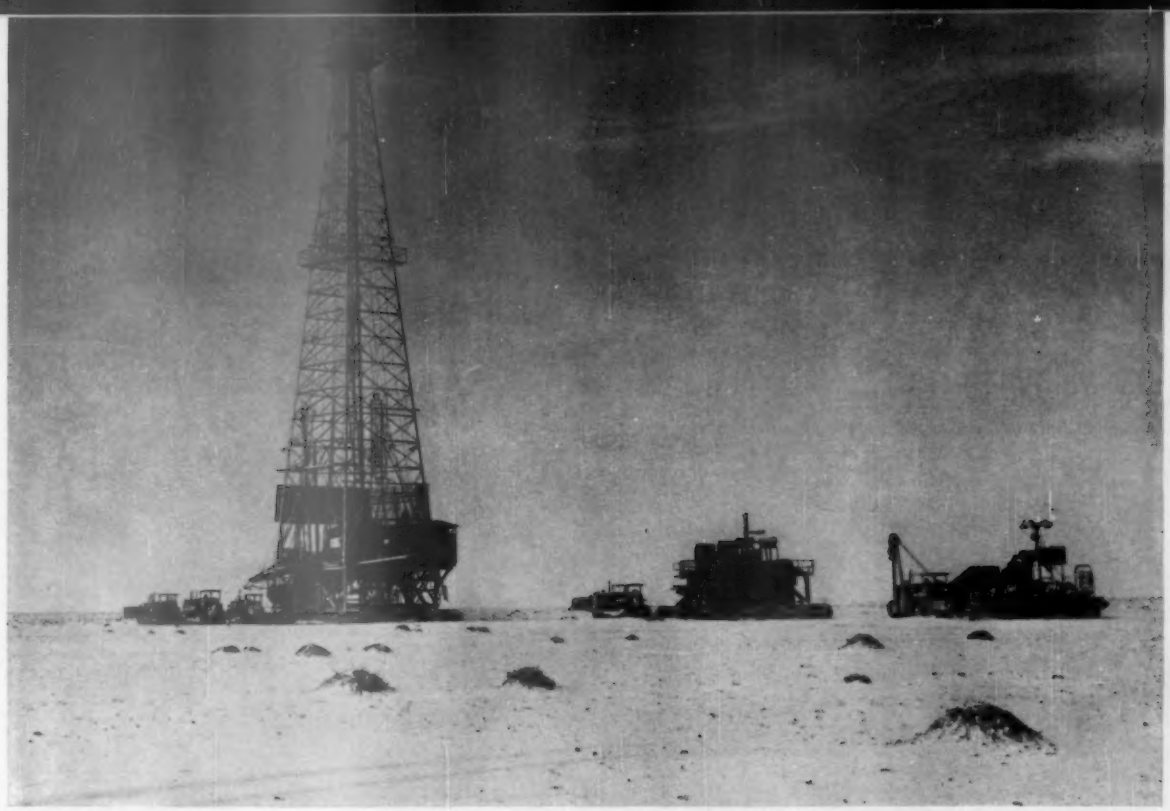
The filters are switched and water from the sand-filter-pump sump is discharged to the bottom of the filter. Flow is controlled by an air-operated hand-control valve. The operation is hand controlled throughout, the rate of flow being controlled to prevent sand from being carried over. The dirtiness of the filter determines the length of time required for the backwash. The backwash water drains to the equalizing basin.

Wet-oil tank. Recovered oil from the oil-water sumps is sent to the wet-oil tank. This emulsified oil is then circulated by a pump through a heater to break the emulsion. After settling in the tank, the oil is pumped off using the same pump and a swing suction.

Water is drained from the tank to the process sewer. Mounted atop the tank is a small tower of filled Raschig rings. Any vapors from the tank are scrubbed in this tower with lake water. Oil and water from the scrubber flow to a small separator. Oil from this separator overflows to the wet-oil tank and water drains to the sewer through a loop seal. The operation throughout is manual, the only instrumentation being the high and low-level alarms on the tank.

To show how effective our waste treatment plant is, a slipstream is taken to an aquarium stocked with various kinds of local fish. This aquarium, as well as the rest of the refinery, is open to the public every Sunday afternoon during the summer months.

EQUALIZING BASIN has a holding time of 24 hours. It's equipped with steam and air pipes for heating and mixing the waste.



DESERT CARAVAN, oil-field style, moves across Kuwait. Here derrick and its substructure lead, pulled by three tractors. Another tractor pulls the engines and their substructure; a third pulls the main mud pump. Moves up to 126 miles have been thus made.

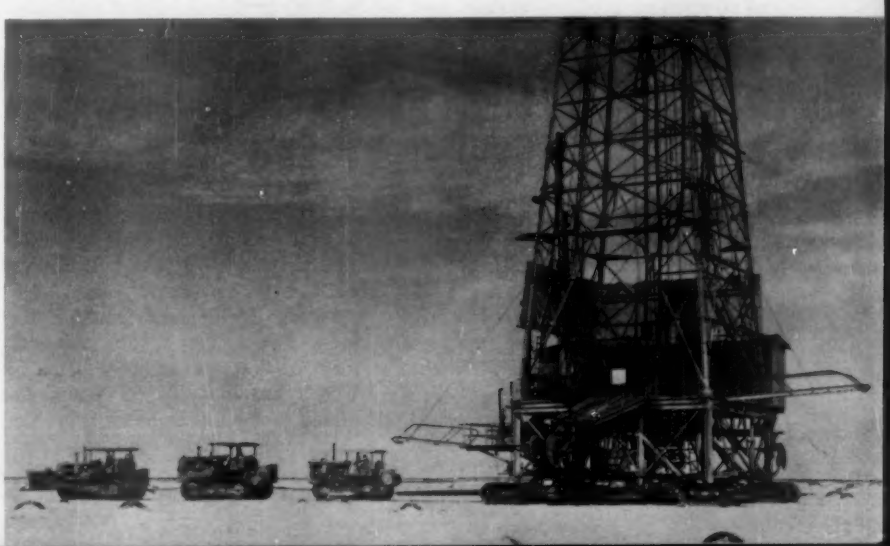
Kuwait caravans move on tracks

. . . making for fast, efficient rig moves over desert sands. Kuwait Oil Co. moves derrick and substructure intact. Mud pumps and mud tanks move on "trailer" with crawler tracks instead of wheels. Six-mile rig move can be made and new well spudded in daylight hours.

HOW TO MOVE drilling rigs from the site of a completed well to the location of the next in the fastest, cheapest manner? That's a common oil-field problem throughout the world.

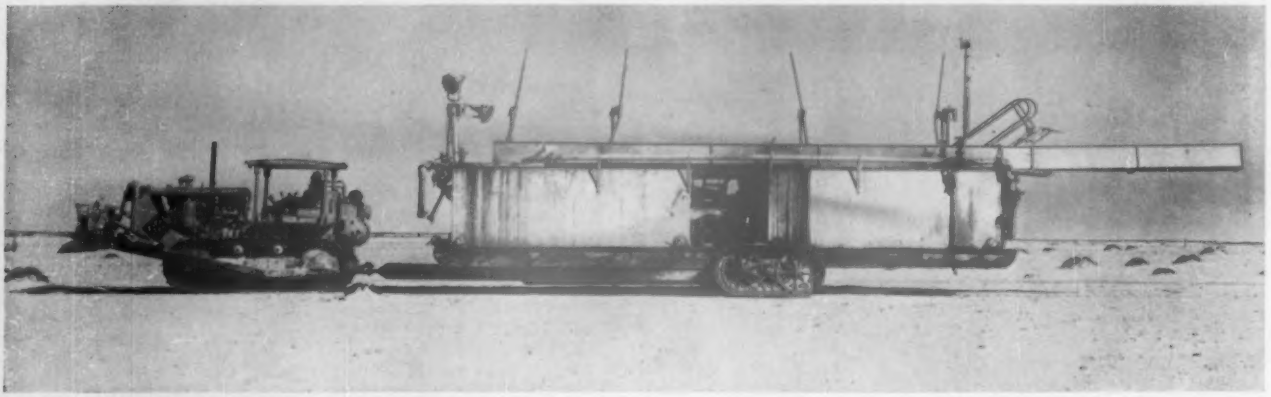
Kuwait Oil Co. solved the problem by a systematic approach to "skidding" the rig on crawler-track carriages. The system has been used satisfactorily to move rigs ranging in size from the largest deep-hole equipment to the smallest water-well digger. Moves have varied from as little as a fraction of a mile to as long as 126 miles.

Moving procedure has steadily improved so that a large rig released on the old location can be jacked up, moved, and spotted on a



CRAWLER-TRACK CARRIAGES, one at each corner, support derrick on the move. Pipe racks and stairways are swung upwards. Blocks are left strung in the derrick with kelly tied down but ready to spud next well.

TWO STYLES OF SUPPORT are used in the "rig-skidding" moves. Engine and substructure in the lead on the left, are supported by four crawler-track carriages. Mud pump in rear is on tricycle support with two track carriages in the rear and with the "tongue" supported by the tractor.



MUD SYSTEM MOVES INTACT so far as possible. Mud "ditch" rides on top of tanks. Fittings and flow lines ride skid between tanks and inside the tanks themselves. Drill string is hauled in trucks to new location; movement starts as soon as pipe is laid down on completed well.

new location 6 miles away in an average of 8 hours. Many moves are even faster.

Fortunately, the Kuwait terrain lends itself to such crosscountry, direct-line moves. As a result, it had been relatively easy to move rigs. The real thief of time was the necessity to tear down the derricks for conventional moves. Now, no derricks are dismantled for moving except in special circumstances.

Kuwait Oil has also speeded its moves by standardizing many items of equipment, unitizing various parts into single skid-mounted loads, and using spacers and other techniques to help spot the rig on the new location.

Concrete corners gone. Early development of the Kuwait fields was with derricks whose substructures were designed for bolting onto concrete corner foundations. To speed moving, these were at first fitted with I-section crossbeams and other bracing. Then, the derrick with draw works and engines was "rolled" away using drill-pipe joints set transversely on timber. This proceeding was cumbersome and slow but was faster than dismantling the derrick.

As the number of rigs in the fields increased the derricks were equipped with I-section skid beams under the structure. In addition, a heavy spreader or brace was fitted between the substructure skid beams at the front and rear. According to the terrain and weather, four to six Caterpillar D8's were necessary, on each side of the derrick substructure, to haul this load at an average speed of 1 mile per hour. The remainder of the equipment was transported on flat-bed trucks. It took 2 to 3 days to complete the move.

Several years ago, the present system, employing Athey tracked bogeys, was tried out and proved an immediate success. In the early days this method was used to move only the derrick and substructure. Later the engine substructure, after modification to a lower level, was also moved on Athey trucks.

Modifying the substructure. For these moves, the derrick substructure is strengthened by heavy I-beam bracing. The skid beams are plated and another beam is welded between them; this latter beam, besides increasing the resistance to bending, has the effect of raising the main skid so the minimum of jacking is required to raise it to the level of the Athey carriage bed. Four jacking points of heavy plate and rail are welded to the skid beams, approximately 4 feet from the corner posts.

For location of the Athey trucks, a hole is cut through the plated skid beams under the derrick corner post. This hole is bushed with 4½-in. drill pipe to take a keeper pin which locates the beam on the truck. The truck is thus set so that the corner-post load is directly over the axle of the tracked assembly.

Preparing for move. The derrick and substructure, with draw works in place, is then jacked up, one side at a time, and the crawler-track carriages are backed under the corner posts and pinned in position. Two 50-ton hydraulic jacks are used at each jacking point. The jacks are actuated by a hydraulic pump.

The total load (100 to 120 tons) depending on derrick and substruc-

ture, is hauled by three to four tractors in line. Two 5-in. pipes with 1¼-in.-thick inserts at each end are used as tow bars, with 6⅝-in. drill pipe as a spreader bar. These are pinned to the leading carriage and the rear tractor towing attachment.

After the derrick is pulled clear of the christmas tree, a 5-in. drill pipe brace is slipped from an H-beam stiffener across the V-opening and pinned to a similar H-beam on the opposite side. Then the substructure becomes a semirigid box frame work.

The engine substructure moves in similar manner. Engine-protecting houses, if any, are braced and moved in the vertical position. This load is usually hauled by two tractors, but when terrain and weather are favorable, one tractor can do the job.

The mud-circulating tanks, flow ditch and mud manifold are mounted on a common base frame and move as a unit. This unit is raised at one end by two 6-by-6 gin-pole trucks. An Athey "cycle" has a 22-ft. clear span. It consists of two 34-in. Athey halftracks joined by one 7¾-in. drill-collar axle beam, with stub axles inset and pinned at each end. The frame of the trailer is made up of 12-by-6-in. I-beam, and is roughly triangular in plan, terminating in a 1¼-in. plate tow bar. One or two tractors, according to terrain and weather, haul this load.

Another unit which travels on a similar Athey cycle is the mud pump. This package also includes the pump's engine and sundry air compressors mounted on a single frame. Total weight is some 30 tons.

Moving procedure. After a rig has been officially released by the petroleum-engineering division, the drilling and rig builder's crew begin rigging down. All connections are designed for fast breakout at the most convenient points. Circulation water, fuel feed, and blowout-preventer lines, etc., which are all color coded, are stored beneath the engine structures.

Pump delivery lines break at the pump and swivel to travel with the mud manifold. Pump suction are broken at hammer-lug unions near the manifold and are carried with each pump. The main-drive chain guard is broken at the center and swivels back in two parts to travel, part with the draw works and part with the engine compound. Heavier service lines, main water supply lines, jetting lines, etc., are broken at the flexible couplings and boarded for transport. All electrical supplies to each unit are disconnected at couplings and the junction lines coiled and stored in a tool house.

The derrick is then jacked up and the Athey tracks fixed in position. At this stage the operation is taken over by the Transport and Plant Department. While the derrick substructure is being prepared for the move, the following equipment is hauled to the new location on flat-bed trucks and spotted in position:

1. Fuel tank.
2. Circulating water tank.
3. Generator and tool-house skids.
4. No. 1 pump.

After the derrick has moved off location, the engine substructure is jacked up and prepared for moving.

Four further flat-bed loads are then hauled to the new location:

5. Sand trap.
6. Reserve tank.
7. 500-bbl. water tank.
8. 500-bbl. water tank.

The two 500-bbl. tanks are spotted on the new location as soon as they arrive.

When the engine substructure has moved off, the circulating mud tanks and the manifold unit, and No. 2 pump and engine assembly are mounted on the Athey cycles and moved.

The remaining flat-bed loads are moved as trucks become available.

9. Tool pusher's hut.
10. Lubricating-oil and fresh-water-storage skid.
11. Service pipes.
12. Dry and chemical rack.
13. Dry and chemical rack.

As a rule, rig moves begin about 7 a.m. and the old location is usually cleared by 10 a.m.

On the new location. Spotting and rigging up on the new location follow a definite order:

1. Fuel tank, circulating-water tank, generator-and-tool-house skids, and the two 500-bbl. water tanks are spotted.
2. Fresh water and fuel haulage commenced and main water storage tanks connected to field main ring.
3. Derrick, engines, main pump, and sand trap are spotted.
4. Drilling and rig-building crews begin rigging up.
5. Mud scheme, reserve tank, No. 2 pump and engine spotted.
6. Remainder of equipment spotted.

The drill string is transferred to the new location immediately after lying down at the previous well. Surface casing and casing tools are also ready on the racks at least 1 day prior to the move.

The move as described is made with the following equipment:

Six to eight crawler tractors (depending on availability).

Four 6-by-6 trucks with oil-field flat bed.

Two 6-by-6 gin-pole trucks.

Eight Athey tracked Rambaugh carriages.

Two one-half tracked Athey cycles.

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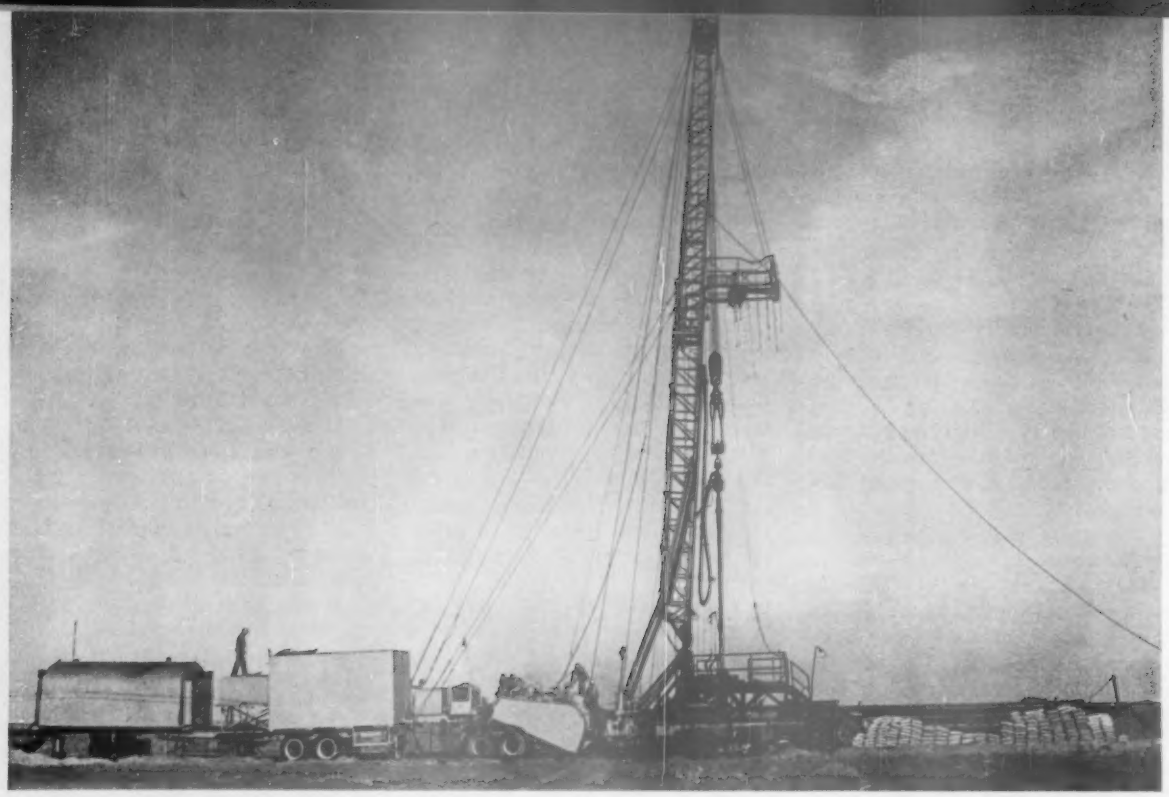
If you would like additional copies, reprints are available through Reader Service, The Oil and Gas Journal, Box 1260, Tulsa. Reprints of the U. S. survey are available at $2 each. Separate reprints of the foreign survey are also available at $2 each.



ALL-TRAILER-MOUNTED RIG of Armstrong Fowler, Inc., can drill to depths of 3,500 ft. Fig. 1.

Trailer-mounted rig drills, completes an 1,100-ft. California well a day

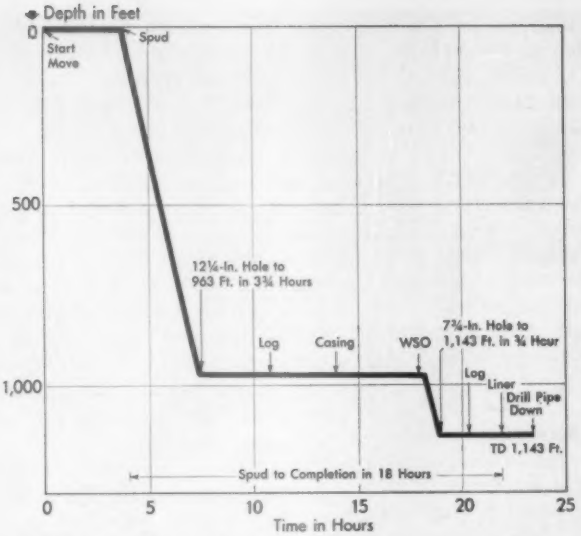
BY JAMES E. ARMSTRONG
Armstrong Fowler, Inc.
Bakersfield, Calif.

TRAILER-MOUNTED MUD TANK of small rig is in operating position in this view. Fig. 4.

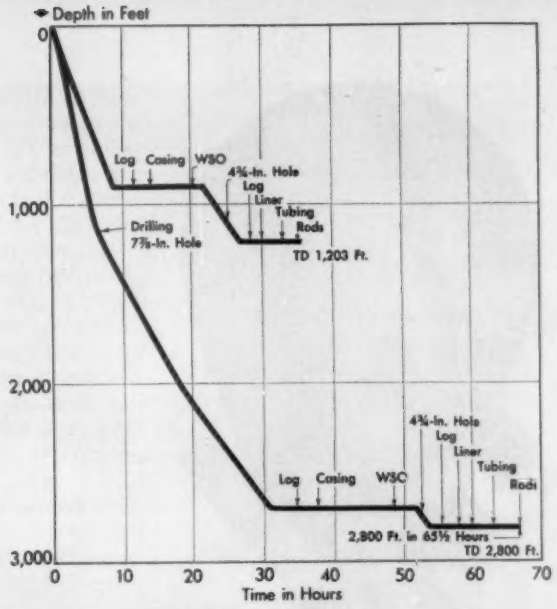
A SHALLOW-DRILLING rig moves so often that it must move cheaply to stay competitive. The simplest way is to mount it on wheels. If this is done, the trailer-mounted equipment should conform to highway laws and, if possible, be designed so no crane or A-frame is needed to tear out or rig up. Pictured on these pages is such a rig operated by our company.

To eliminate the crane or A-frame time, the rig must be matched, or consistent throughout; if pumps are trailer mounted to eliminate use of a crane, then it would be senseless to use a subbase which still requires the crane. Alignment between units must be flexible. A lot of time can be wasted if positioning must be exact; the driver must have unusual skill to spot a semitrailer within 1 or 2 in. of a target.

This article is taken from a paper titled, "Reduction of Shallow Drilling Costs by Organization and Planning," presented by the author to the 1961 meeting of API Division of Production's Pacific Coast District, Los Angeles.



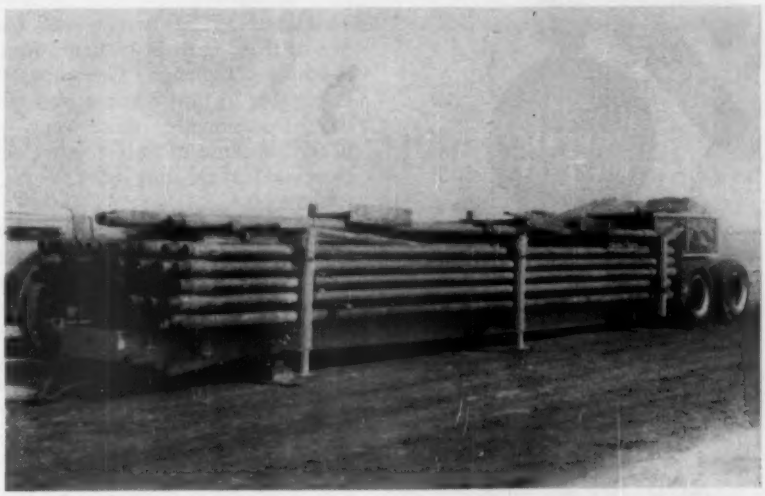
CURRENT AVERAGE DRILLING TIME at Kern River oil field, Kern County, California. Fig. 2.



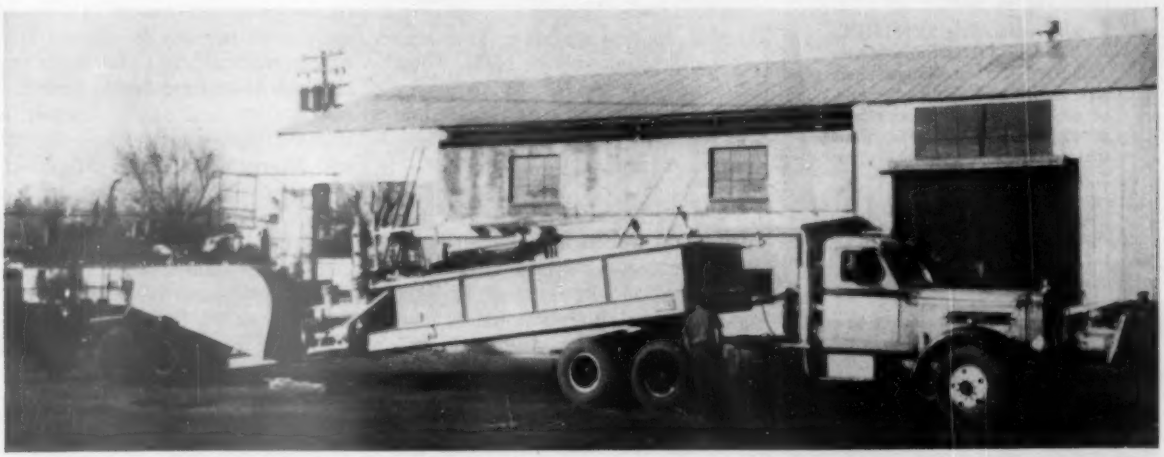
TYPICAL DRILLING-TIME CURVES at Coalinga oil field, Fresno County, California. Fig. 3.

Of course, there are places where spotting to the center of the hole must be exact. An example is the mast-draw-works assembly matching with the subbase assembly; special guides should be used to align the units. On these particular assemblies, a 6-in. misalignment is optimum because table and blocks must be over the hole; on other loads, design should allow as much as 2-in. misalignment.

Fig. 1 is our company's all-trailer-mounted rig designed for depths to 3,500 ft. It consists of a 180,000-lb. guyless mast unitized with 200-hp. draw works and a single 280-hp. V-8 engine. The 7¼ by 12-in. pump is powered by twin 300-hp. engines and unitized with a 100-bbl. shaker pit. The 10-ft. subbase is



TRAILER-MOUNTED PIPE BASKET loads the same way as the shaker tank-pump assembly. Fig. 6.



SHAKER TANK-PUMP ASSEMBLY is being raised for moving. Bottom of tank slopes for quick cleaning. Fig. 5.

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unitized with the walk trailer. There is a trailer-mounted pipe basket (not visible in Fig. 1), and a combination assembly which carries the dog house, a fuel tank, a 170-bbl. water tank, and a lube-oil rack.

Recently, in a 30-day period, this rig drilled and completed for one operator 23 wells aggregating 28,000 ft. of hole. Because this operator let all this work on a single contract, overhead cost per well was less than one-half what it would have been for a two or three-well program.

As little as 15 hours. Fig. 2 charts the current average drilling and completion time for shallow wells in Kern River field of Kern County, California. On a 25 or 50-well program, it is generally the tenth to fifteenth well before a contractor is able to perform on such a basis consistently. The best record for one of these wells is 15 hours from spud to completion. Generally, it is possible to turn out one well per day. Occasionally, more time is needed because of testing, extra cementing for plugging back, or rig difficulty.

Fig. 3 is a depth-time curve for typical wells in Coalinga field of Fresno County, California. The wells there were drilled several years ago and their curves are not as startling as the Kern River curves. Still, they reflect the advantages of modern drilling practice with an efficient rig. We believe these drilling times definitely could be improved on today.

In the 23-well program mentioned above, the average moving time was less than 4 hours, including unrigging, loading out, moving, rigging up, and spudding. Time was about the same day or night. Total trucking expense for all 23 moves was less than $2,000. No crane or A-frame was required for any portion of the rig.

Rig packages. The rig is completely on wheels and, for all practical purposes, is always loaded out. Anything on the ground is light enough to be either handled by men or serviced with a catline. Fig. 4 is a closer view of the rig and shows the trailer-mounted mud tank in operating position. When unrigging, the kelly with swivel and the drill collars are left in the V-door of the base and the rails and platform are folded up and toward the center with the catline.

Fig. 5 shows the shaker tank-pump assembly being raised for moving. Bottom of the tank slopes for quick cleaning. Because tank and pump are permanently mounted together, rigging up is simpler; after a move, the only flexible connections which must be made in order to spud are the bumper hose to the rig, the flow line, the fillup line, and the water line.

There is a kingpin and pressure plate under the mud-tank end of this trailer. The unit is loaded by backing a tractor up to the load and winching the unit on the fifth wheel. The load is legal and requires no permit to move.

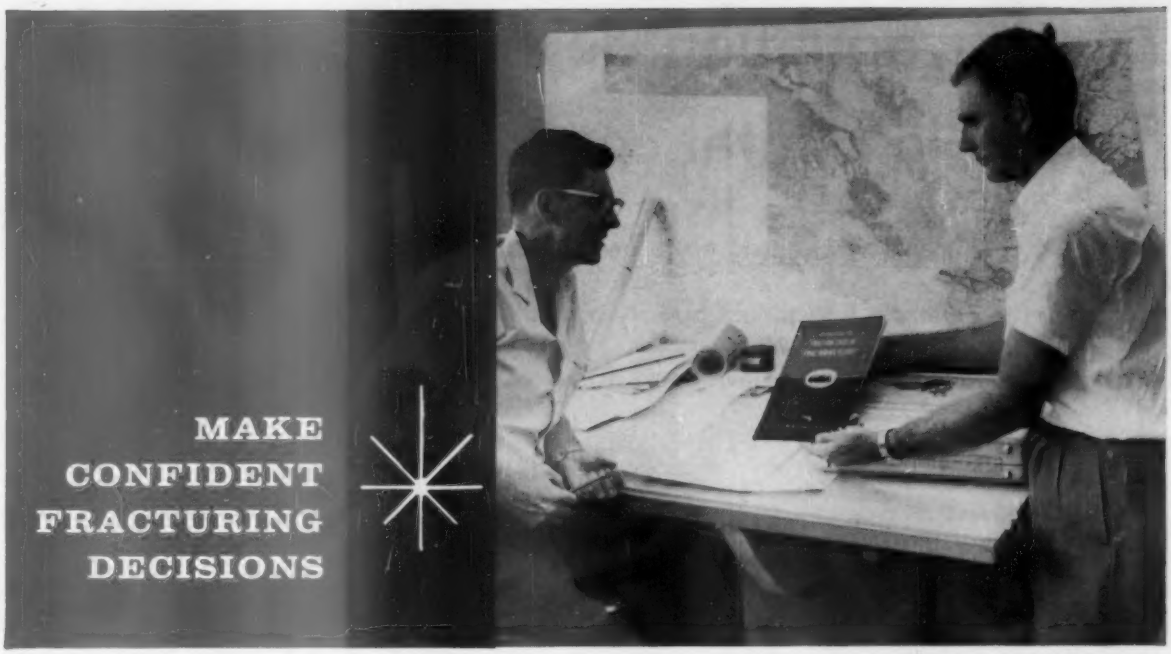
The trailer-mounted pipe basket, shown in Fig. 6, loads the same way as the shaker tank—pump assembly. The permanent loading sling is visible in Fig. 6. On the rear of this load over the wheels are mounted the junk bins and on top of this load are disassembled pipe racks.

On highway moves, 1,900 ft. of pipe and drill collars are carried in the basket. On off-highway moves, up to 3,000 ft. of 4½-in. drill pipe may be carried.

In operating the rig, jobs are dovetailed as far as possible to save time. For example, while circulating or cleaning out for a water-shutoff test, we generally make up the tools on the walk. Tubing protectors can be removed while logging and rods can be made up into doubles to speed later running.

It isn't surprising that such a rig designed and operated for speed costs more per day to operate than a conventional rig. The faster rig has less down time and is generally run harder and faster. Result is higher - than - normal fuel, supply, and maintenance costs. Moreover, the rig costs more to buy than a rig which isn't trailer-mounted. And the crews must be paid extra for their exceptional efforts.

Of course, cost of the rig is not the final value. Rather, the important thing is cost per foot of hole. In spite of its higher cost and higher operating expense, our rig has regularly drilled fast enough to make important cuts in the cost per foot of hole.



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Z-factor equation developed for use in digital computers

Only 36 coefficients need be stored to permit a digital computer to generate Z factors. Capacity of small computers is not taxed, and mean deviation is as low as 0.004

BY A. M. SAREM

. . . research engineer in the production research department of Sinclair Research, Inc. He joined Sinclair in 1954 and since that time has done research in the field of fluid flow in porous media and phase behavior of hydrocarbons and associated fluids. He holds BS and MS degrees from University of Tulsa where he has also done postgraduate work in mathematics.

NATURAL-GAS and reservoir-engineering calculations involving the compressibility factor Z can best be handled in a computer program if the Z factors can be generated internally by a digital computer.

An accurate method of getting Z factors from a computer by use of a 20-by-20 input table was recently developed by Gray and Sims.[1] But for small and medium-sized computers the memory storage needed for this table lookup method seriously limits the scope of related programs. What is needed is a method that will supply the Z factors without using much storage capacity in a small computer.

The solution. To solve this problem, an equation requiring storage of only 36 coefficients was fitted to a chart in which Z was expressed as a function of p_r and T_r. Two sets of Legendre polynomials were used and the coefficients were found by the method of least squares.

Accuracy of such an approximation depends on the degree of the polynomials and the magnitude of the intervals chosen for fitting, among other things. For convenience and desired accuracy, the compressibility chart was tabulated at intervals of 0.1 on p_r and T_r for values of p_r between 0.1 and 14.9, and values of T_r between 1.05 and 2.95. Polynomials up to fifth degree were used.

The general equation is:

$$Z = \sum_{m=0}^{5} \sum_{n=0}^{5} A_{mn} P_m(x)\, P_n(y)$$

Where:

$$x = \frac{2p_r - 15}{14.8}$$

$$y = \frac{2T_r - 4}{1.9}$$

P_m, P_n are Legendre polynomials of degree m and n, respectively.

$$A_{mn} = \frac{\int_x \int_y Z(x,y)\, P_m(x)\, P_n(y)\, dy\, dx}{\int_x \int_y P_m^2(x)\, P_n^2(y)\, dy\, dx}$$

Expressions for the Legendre polynomials of degree 0-5 are given in Table 1. Calculated coefficients, obtained by numerical integration from the Z factor chart, are listed in Table 2.

TABLE 1 — LEGENDRE POLYNOMIALS OF DEGREE 0-5

$P_0(x) = 0.7071068$
$P_1(x) = 1.224745x$
$P_2(x) = 0.7905695\ (3x^2 - 1)$
$P_3(x) = 0.9354145\ (5x^3 - 3x)$
$P_4(x) = 0.265165\ (35x^4 - 30x^2 + 3)$
$P_5(x) = 0.293151\ (63x^5 - 70x^3 + 15x)$

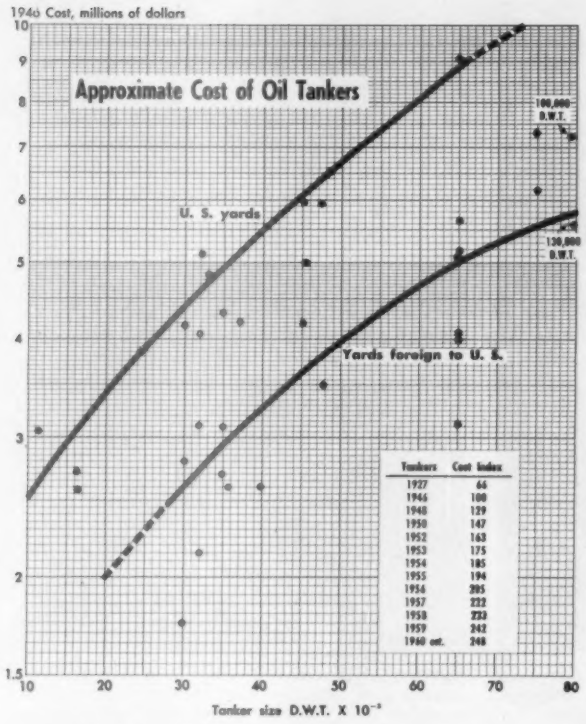
Mean deviation between Z factors calculated by the method shown here and those appearing in the original chart was found to be acceptable. On the boundaries of the chart, where $T_r = 1.05$ and 2.95, and $p_r = 0.1$ and 14.9, 53 points showed a mean deviation of 0.013. For 300 points scattered uniformly throughout the chart, mean deviation was found to be 0.004.

References

1. Gray, E. H., and Simms, H. L., "Z Factor Determination in Digital Computers": The Oil and Gas Journal, July 20, 1959, p. 80.
2. Poettman, F. H., and Carpenter, P. G., "The Multiphase Flow of Gas, Oil, and Water Through Vertical Flow Strings with Application to the Design of Gas-Lift Installations": API Drilling & Production Practices, (1952), p. 257.
3. Brown, G. G., Katz, D. L., Oberfell, G. G., Alden, R. G., "Natural Gasoline and the Volatile Hydrocarbons": Section One Sponsored by NGAA, Tulsa, (1948), p. 38.

TABLE 2—VALUES OF THE COEFFICIENTS, A_{mn}

	m=0	m=1	m=2	m=3	m=4	m=5
n=0	2.1433504	0.083176184	−0.021467042	−0.00087140318	0.0042846283	−0.0016595343
n=1	0.33123524	−0.13403614	0.066880961	−0.027174261	0.0088512291	−0.0021520929
n=2	0.10572871	−0.050393654	0.0050924798	0.010551336	−0.0073181933	0.0026959963
n=3	−0.052184040	0.044312146	−0.019329465	0.0058972516	0.0015366676	−0.0028326809
n=4	0.019703980	−0.026383354	0.019262143	−0.01153539	0.0042910089	−0.00081302526
n=5	−0.0053095900	0.0089178330	−0.010894821	0.009559389	−0.0060114017	0.0031175170



APPROXIMATE COST of oil tankers. Fig. 1.

What does a tanker cost?

BY W. L. NELSON
Technical Editor and Refining Consultant

What is the cost of an oil tanker? G.F.N.

Ships built in U. S. yards are much more expensive than vessels constructed abroad because of the very high wage rates of U. S. workmen. This is clearly evident in Fig. 1 here, which shows approximate costs from the references listed. The costs were converted to a 1946 basis by means of the cost index shown on Fig. 1 and in the future the index can be computed by weighing the index for plate steel by 60% and the refinery construction labor index by 40%, both of which are published each quarter (January, April, July, and October) on the Itemized Cost Index page of the Journal.

The costs for vessels built in foreign yards are less satisfactory not only because wages are different in each of the countries, but also because the tanker cost index developed here probably does not apply equally well to all of the countries. In addition, vessels are sometimes built on a speculative basis which means that some ships are sold at exceedingly high prices whereas others may sometimes be sold at little or no profit. At least two vessels during 1959 were built[10 13] in hopes of high prices and were finally sold at a discount of 25% from the prices stated earlier.

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1. Staff, "5-Year Tanker Plan...": The Oil and Gas Journal, December 10, 1956, p. 88.
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3. Staff, "How Big Tankers Cut Costs": Pet. Week, September 18, 1959, p. 52.
4. News, "Tanker Deal Brews": The Oil and Gas Journal, November 19, 1956, p. 146.
5. News, "Tidewater's Fleet Grows Fast": The Oil and Gas Journal, January 28, 1957, p. 123.
6. Jennings, B. B., "How Freedom of Competition Has Cut...Costs": Nat. Pet. News, November 26, 1952, p. 93.
7. News, "The Market Trend": Pet. Week, June 22, 1956, p. 39.
8. Ibid., August 10, 1956, p. 43.
9. Grover, D. H., "Whither the Supertanker": Oil Forum, June 1957, p. 204.
10. News, "The Market Trend": Pet. Week, May 22, 1959, p. 44.
11. News, "Big Tanker Orders Mounting": Pet. Week, February 8, 1957, p. 34.
12. News, "Tanker Owners Stampede for New Ships": Pet. Week, September 2, 1955, p. 9.
13. News, "The Market Trend": Pet. Week, September 11, 1959, p. 50.

Questions on TECHNOLOGY

Air in feed stock fouls exchangers

We are finding severe fouling of heat exchangers in our desulfurization unit. Dense, gummy deposits appear after only a few weeks of operation. The feed is a clean straightrun material so we do not see where the dirt is coming from. What can be causing this? T. W. J.

Although straightrun materials contain only traces of unsaturated or reactive hydrocaroons, everyone is familiar with the fact that oxidation products are produced on long contact with air especially if exposed to light. Sample bottles of newly distilled clear material soon begin to develop a color, and after a time deposits of dark gummy or resinous condensation products may appear. Thus, oxidation products may be the cause of your fouling troubles.

Naphthas and gas oils absorb oxygen during storage and when heated to 350°-500° F., resins are deposited in the heat-exchanger system, and due to their sticky nature they may cement foreign debris into the fouling deposits. Oxidation products are especially troublesome when handling the less-stable materials produced by cracking, particularly the products of coking or viscosity-breaking operations.

The problem is, of course, to keep air away from the products. There are several ways to do this:

1. Do not go to storage. Pump the sidestream product of the primary distillation or feed preparation unit directly to the heat exchangers of the process (such as desulfurization, reformer, or rerun units).

2. Use small intermediate storage tanks to reduce exposure time.

3. Use floating-roof storage tanks in which the hydrocarbon gases from the material constitute the gas phase trapped in the top of the tank.

4. Blanket the feed storage tank with nitrogen by admitting a small amount of nitrogen each day or when withdrawals are made.

5. In the extreme, the feed may need to be stripped with methane or hydrogen by heating it to 200° F. and admitting 2-5 cu. ft. of gas for each barrel of material.

The use of floating-roof storage usually suffices for straightrun materials and if blanketing is used, nearly complete elimination of fouling is possible.

PADDED BOLSTERS on sides and bottom of railroad cars are used to protect coated and wrapped pipe during shipment from the coating yard at Franklin Park, Ill., to job site.

RUBBER-TIRED CRADLE was used for lowering the yard-coated pipe into the ditch. Outer wrap of paper is not an integral part of the coating and wrapping but served as temporary protection during shipment and handling.

Special handling needed for yard-coated pipe

BY DICK GAVITT
Service Pipe Line Co.

AN EVALUATION of the cost of using yard-coated pipe on medium-sized cross-country lines is under way in the Missouri-Illinois division of Service Pipe Line Co.

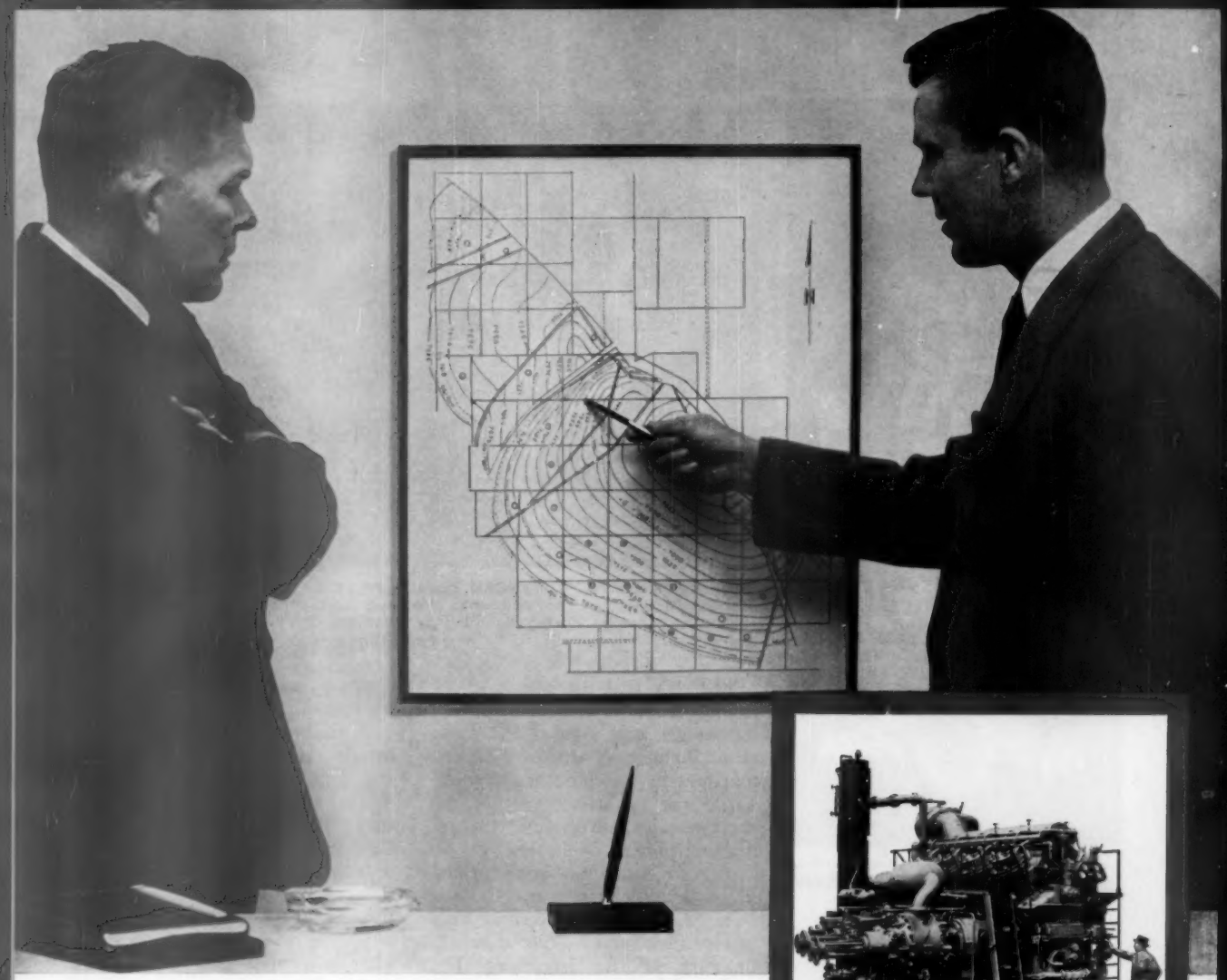
LIGHTWEIGHT, YARD-COATED pipe is undergoing field evaluation on a cross-country construction project of Service Pipe Line Co. Three loops, totaling 60.5 miles, are being added to 12-in. trunk line from La Platte, Mo., to Wood River, Ill.

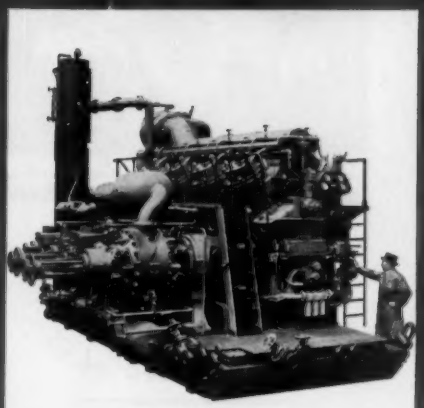
Some 60 miles of 12-in. loops are being constructed on Service's crude oil line from La Plata, Mo., to Wood River, Ill., the longest project on which the company has used only yard-coated pipe.

The first of three loops is a 14.7-mile segment extending east from Sue City, near La Plata. Others are a 21.4-mile segment near Auburn, Mo., and a loop of 24.5 miles north of St. Charles, Mo. Completion of the project will increase the capacity of the La Plata-Wood River line from near 80,000 to about 100,000 bbl. per day.

The decision to use yard-coated pipe stemmed originally from the fact that nearly half of the loops were to be laid with 12-in. pipe which Service had in storage at its Manhattan, Ill., station. This X-42 grade, 0.250-wall-thickness pipe had been subject to considerable scaling and corrosion because of industrial fumes in the storage area. Shot blasting was needed to prepare it for coating, and there was no over-the-trench equipment capable of doing this economically.

Lightweight pipe. With this in mind, Service engineers recommended that not only the stored pipe be shot-blasted and yard-





This 1,440 horsepower plant is capable of handling more than 6½ MMCFD with injection pressures up to 5,000 psi. It is now in use in a major producing area.

From Attic Oil to Retrograde Condensation . . .

C-B/S Compressor Plant Designs Solve Your Problems in Gas Injection

To build a compressor plant, whether it's 100 bhp or 1,440 bhp, to operate with economic efficiency in a gas injection system, the manufacturer must be able to recognize and understand your problem. C-B/Southern builds compressor plants which meet the complex requirements of artificial recovery such as pressure maintenance, cycling, and other secondary recovery operations. Here is experience drawn from building more than 40,000 compressor horsepower last year, much of it for gas injection systems, and the years C-B/S people have spent as oil and gas engineers. That is why C-B/S knows how to design and build the compressor unit that works most economically and most efficiently with your gas injection system.

And remember: C-B/S compressors are available in sizes from 100 to 10,500 horsepower.

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CHIEF INSPECTOR A. J. YAVORN, Service Pipe Line Co. (right) watches while contractor's employes coat and wrap a welded joint. Minor flaws in yard coating, caused by damage during handling or bending, also were repaired by hand on the job.

coated, but that the remainder of the project be completed with new, lightweight pipe treated the same way. Preliminary studies indicated that over-the-trench coating methods would not be economical for the short distance involved in the remaining portion of the line.

Approximately 28 miles of the 12-in. 0.250-wall pipe was shipped from Manhattan to a coating yard of Pipe Line Service Corp. at Franklin Park, Ill., for processing. For the remaining 33 miles, Service used new 12-in., 0.219-wall, X-46 grade pipe. This marked the first time that Service had used such lightweight pipe on a 12-in.-diameter line, although it had been used previously on smaller lines.

All pipe except that used on river crossings was shot-blasted, coated, and wrapped at the Franklin Park yard. Standard Pipeprotection, Inc., St. Louis, handled the pipe for the crossings. An intermediate-range coal-tar-enamel coating was used throughout.

Special handling . . . Some extra care was required in handling the pipe, both in shipment and on the job site, partly because of the nature of lightweight pipe and partly to avoid damage to the coating. Shipments left the yard in railroad cars equipped with padded bolsters on the bottom and sides, and each carload was strapped together as a unit to prevent sliding or shifting. During construction, a rubber-tired cradle was used on the side-boom for lowering the line into the ditch.

A padded shoe on the hydraulic bending machine helped minimize any coating damage involved in making bends. The fact that bends in the thin-wall pipe were limited to 12° per joint was another factor in reducing damage. Such coating flaws as did develop in the process were repaired by hand-coating and wrapping on the spot. Field joints, after welding, also were hand-coated and wrapped.

Service's preliminary studies indicated that while over-the-trench coating methods are generally more economical in long-line construction, the peculiarities of the La Plata-Wood River loops made the use of lightweight, yard-coated pipe attractive. The company is now in the process of making a more complete analysis of cost, comparing the two methods, and evaluating the experience gained during actual field use of yard-coated pipe on a cross-country line.

Solid-state system to control gas line

A SOLID-STATE control system will be installed by Texas Eastern Transmission Corp. to regulate three satellite stations from a master station. Eventually, the system will be extended to the company's 128 stations.

The initial installation will be

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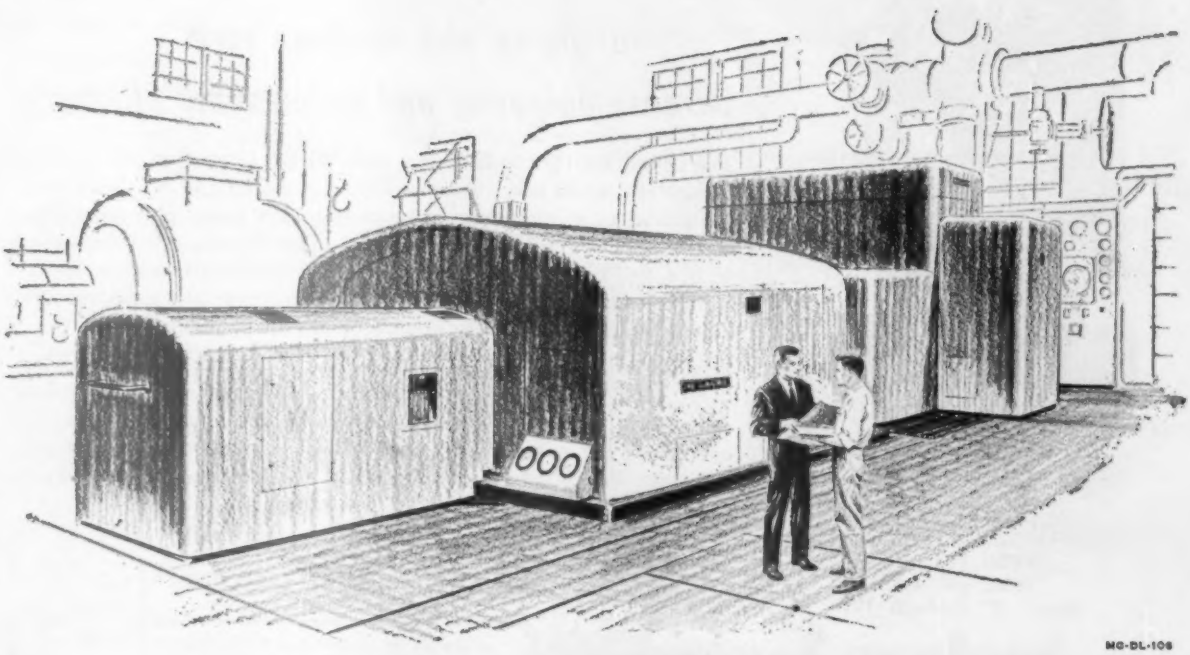
engineered
flexibility
lets a turbine "grow"

With his eye on tomorrow, a major food processor gave De Laval unusual requirements. He wanted a turbine that would meet today's power and process steam needs . . . and be capable of almost doubling its output in the future. The result: a De Laval turbine to which five additional stages can be added in the customer's plant.

Present capacity of this unit is 5,000 kilowatts which will be raised to 9,375. For future operations, steam pressure and temperature will also be sharply increased.

Whether you need a turbine that can "grow" or have other problems involving heavy rotating machinery, De Laval engineered flexibility can help.

De Laval Steam Turbine Company, Trenton 2, N. J.



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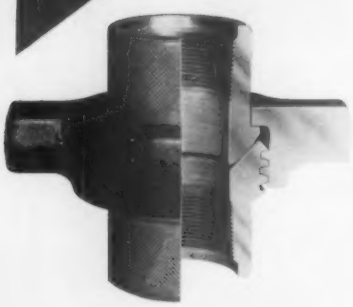

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4000 psi test
Sizes: 2" through 12"

The complete line of WECO Unions includes sizes 1" through 12", pressure ratings 1000 psi through 15,000 psi.

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increase operating and maintenance efficiency

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Standardizing with WECO Unions means you can transport equipment, such as standard pipes, pumps, mud tanks, and other piping assemblies from one rig to another. Streamline and modernize your operations by standardizing with WECO Unions on all your rigs. Ask your WECO representative about the benefits and advantages of the WECO Union standardization program.

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made by Control Corp. which has contract for $150,000 for the first portion.

The equipment furnished by Control Corporation will be the first of its new solid state control systems which use transistorized components of the type currently being used in its large-scale solid-state digital computers.

In the initial installation, a master station and three satellite stations will be joined by a common digital computer language operating over microwave communication channels.

Texas Eastern's pipeline complex extends from Northwest Louisiana to New Jersey, with numerous lateral pipelines and pipeline loops. This new control system is part of an $83 million expansion program to provide for delivery for an additional 225 M.M.c.f.d. of gas. The master dispatching control center is to be at Shreveport, La., and the initial three satellite stations are to be located at Berne, Ohio, West Monroe, La., and Danville, Ky.

Turbine to be used on product line

Phillips Pipeline Co., Bartlesville, Okla., has ordered a Solar Aircraft Saturn 1,100-hp. gas-turbine engine to be used with a liquid-products pump in its pipeline operations.

The engine, a two-shaft, diesel-fuel-burning version of the Saturn engine, will be used to boost pressures at various location sites. A new type of Carter pump will be driven by the turbine.

This application is a departure from standard units. It reduces the over-all length of the pumping package from 178 to 98 in. The result is increased portability for remote location operations.

The engine, coupled to the pump, will deliver 1,900 gal. per minute at a 2,500-ft. head. The new unit will be used to pump butane, propane, and other liquid products.

In a similar application, Okan Pipeline Co. is operating a Saturn turbine-powered petroleum pump on its pipeline from southwestern Kansas to Tulsa.

Maloney-Crawford solves Another sour gas problem

TRANSWESTERN PIPELINE CO.'S PROBLEM: 100 grains H_2S/100 CF in an 18 MM-SCF/D stream.

THE REQUIREMENT: Reduce H_2S to .25 grains/100 CF.

M-C' SOLUTION: An automated Sweet-A-Mine gas treating plant with ratio-rate control system.

THE RESULTS: H_2S content reduced to .089 grains/100 CF. The actual field report on the Sweet-A-Mine's performance is reproduced at right. Read it for proof that M-C can solve your sour gas problem.

TRANSWESTERN PIPELINE COMPANY
MEASUREMENT DEPARTMENT
SULPHUR DETERMINATION TEST REPORT

Company or Producer: TWPL Co. Date: 7-9-61
Field or Location: Contract Number:
Source or Reservoir: Field & Res. No.:
Well or Station Name: Exter Station Number:

Analysis of gas for H_2S, RSH, RSR & RSSR using Austin Titrator

Bromine titration results expressed in milliamperes generating current required to maintain a fixed level of free bromine in the generating cell during selective scrubbing processes. Gas flow set at 500 cubic centimeters per minute.

Test Data

A. Blank (filtered sulphur free gas)	.050	ma.
B. Total Sulphur (unscrubbed gas)	1.036	ma.
C. H_2S removed (selective scrubber)	.865	ma.
D. H_2S & RSH removed (selective scrubber)	.323	ma.
E. H_2S, RSH & RSR removed (selective scrubber)	.195	ma.
A^1. Blank rerun (if $A^1 \neq A$, rerun)	.080	ma.

Calculations

Sulphur Derivative		Equation	Grains /100 CF
H_2S	Hydrogen Sulfide	.52 x (B-C)	.089
RSH	Mercaptans	.44 x (C-D)	.216
RSR	Sulfides	.90 x (D-E)	.128
RSSR	Residual Sulphur	.50 x (E-A)	.048
	Total Sulphur		.581

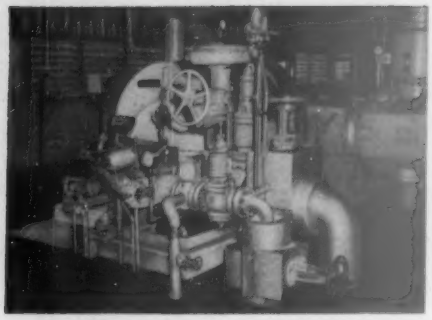
Remarks:
Analysis By: DJ Roberts Witness by:

CONCLUSION: If you have a sour gas problem, send it to M-C. You'll get an authoritative solution.

Maloney-Crawford

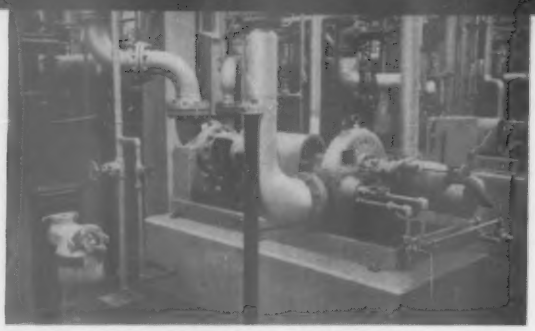
Designers and Manufacturers of Processing and Production Equipment

Box 659 Tulsa

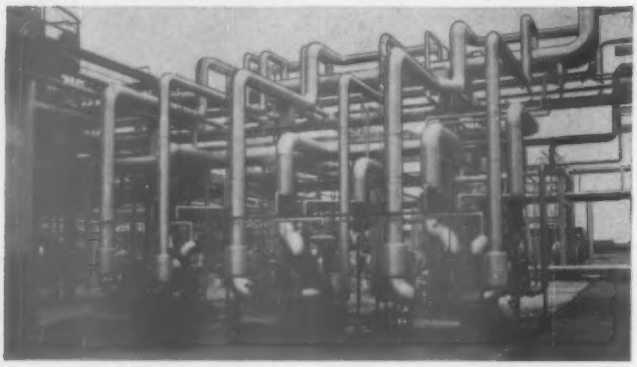


600-hp Elliott turbine driving a compressor which supplies compressed air for process.

(Right) Elliott steam turbines power many reflux pumps throughout the refinery. Shown here are three, driving gasoline column bottoms pumps in the crude unit.

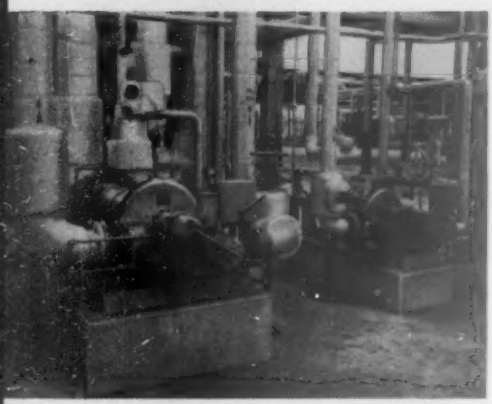


The YR turbine shown above drives an oil pump in the alkylation plant.



The turbine-driven condensate pump shown below charges foul condensate to stripper column.

Below are forced-draft fans driven by Elliott turbine-gear units in one of the refinery's boiler plants.



The unit on the left above is a condensate pump, and the one on the right is a seal oil and flushing oil pump. Both are driven by Elliott turbines.

FROM TURBINE HEADQUARTERS

In one refinery, 85 Elliott turbines driving pumps, compressors, fans prove Elliott versatility

Ranging in size from 5 to 935 horsepower, these Elliott YR single stage turbines are installed in a giant East Coast Refinery. The units were selected from a modern, field-proven line of mechanical drive turbines rated up to 50,000 horsepower.

Installations like this together with experience of more than 50 years in turbine design, manufacture and application are among the reasons why Elliott is truly "Turbine Headquarters." Write for descriptive bulletin H22-D. HI-2

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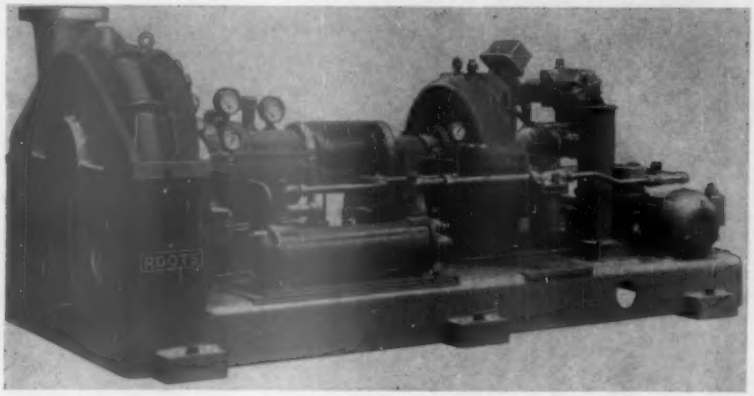
What's NEW . . . in equipment



WORKING PRESSURES to 500 psig. and operating temperatures to 800° F. can be handled by new centrifugal compressor.

New compressor fits plant needs

MODELS of this Model HTP single-stage centrifugal compressor are available with inlet capacities from 500 to 5,000 c.f.m. Because of its high-speed characteristics and the variety of seals with which it can be fitted, the compressor is expected to prove particularly suited for applications in refineries and petrochemical plants.

Basically it is a constant-pressure, variable-volume machine with a wide range of stable operation. A steam turbine, gas turbine, or electric motor can be used to drive the compressor through a speed-increasing gear.

To simplify installation, the designer has mounted the machine complete with driver and accessories on a heavy, one-piece, fabricated-steel base plate. The impeller, available in open and closed types, mounts on a forged-steel shaft supported by external pedestal bearings. A heavy-duty inlet section and volute form the casing. Only one shaft seal is required. The bearings are a full-pressure-lubricated type. Source: **Connersville Blower Div., Dresser Industries, Inc.,** 900 W. Mount, Connersville, Ind.

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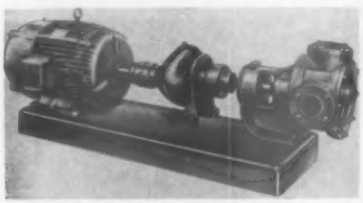


Pumps for 200 to 450 g.p.m.

Three capacities are offered in this new helical-gear-driven pump—200, 300, and 450 g.p.m. The pumps are a positive-displacement, rotary type suited for pressures to 200 psi.

An independently mounted Size C helical-gear speed accepts any one of five gear ratios capable of transmitting a maximum of 25 hp. to 350 pump r.p.m. and 40 hp. at 520 pump r.p.m. The three sizes of pumps with the five gear ratios and either a 1,750 or 1,150-r.p.m. motor permit a capacity range from 65 to 450 g.p.m. Source: **Viking Pump Co.,** George & Wyth, Cedar Falls, Iowa.

•

Lubricator alarm and control

Valuable machinery can be protected against damage due to lack of oil in the lubricator or mechanical failure of the drive mechanism with a new device, called a Lub-Sentry, Model A-29713. When the device is installed in a lubricator reservoir, it will sense any malfunction and either stop the machinery, sound an alarm, or light a signal.

It consists of a standard lubricator feed that circulates oil through a contained pressure valve. A relief valve that discharges at 100 psi. allows oil to return to the reservoir. In the event of mechanical failure or a lack of oil, the pressure will drop through a controlled orifice incorporated in the valve. Source: **McCord Corp.,** East Grand Blvd. at Piopelle, Detroit 11, Mich.

•

New tong die

A tong die has been developed to give a better and longer-lasting grip without damage to tool joints, than is possible with older designs. The Big D die has a hard, strong tooth design that cradles the pipe to give a positive grip without slippage or damage to the pipe or coupling. Source: **Drilling Equipment Mfg. Co.,** Box 4728, Oklahoma City, Okla.

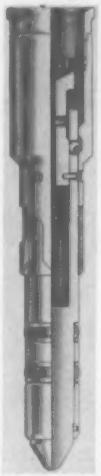
Kit to heat-join plastic pipe

A complete kit of equipment to heat-join pipe made of Delrin acetal resin is available. Only a few tools are needed to install the pipe—a 1,500-watt portable a.c. generator, a special heat-joining tool, cold ring, chamfering tool, and pipe cutter.

Since it weighs only 23 lb., the kit is easy to carry on location. Basically, the joining process consists of melting a layer of the pipe's outer surface and a layer of the inner surface of a factory-installed sleeve type of coupling and then joining the pipe and coupling under hand pressure for several seconds until the molten resin solidifies. This procedure, the maker says, yields an integral, leakproof joint stronger than the pipe. Source: **P & S Engineering Co.,** Box 1051, Bartlesville, Okla.

•

Expendable packer seal plug



This Type RE packer sealing plug is designed to function as a permanent, retrievable, or expendable plug and can be used with all of the maker's drillable packers. It requires no special adapters, latches, or other modification to the packer.

The plug is designed to be set in the maker's packer either by conventional wire-line methods, or by running the plug in on the tubing string and setting it in the packer with rotation of the tubing. The plug is also designed to be dropped into wells with heavy fluid and pumped into position. It comes in three sizes: 4½, 5½, and 7 in. Source: **Otis Engineering Corp.,** Box 35206, Dallas 35, Tex.

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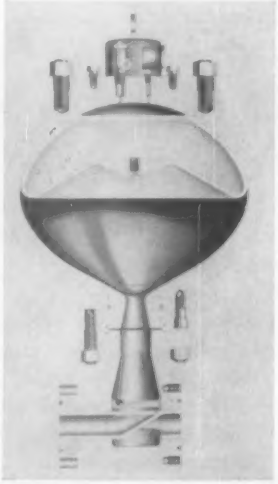

New pulsation dampener

A venturi type of surge dampener has been brought out that is designed to direct the pulsations into the surge chamber for absorption by a compressible gas pocket and to provide a secondary dampening ac-

"Triple Threat"
TO SUCKER ROD FATIGUE
1. JONES SUCKER RODS
2. JONES UNDERCUT PINS
3. JONES ROLLED THREADS
1
Rolled threads are stronger at the point where most pin failures originate . . . steel fibers and grain are rearranged to follow the thread contour, providing a dense structure at the critical thread root. Sucker rods with rolled threads make up tighter and stay tight because there are no high spots to beat down and cause the joint to loosen.
Undercutting the pin shank further increases fatigue resistance by eliminating the run-out thread and improving the elasticity of the joint.
Ask your Jones representative for further information on the "Triple Threat".
THE S. M. JONES COMPANY
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Sales Office: Enterprise Building, TULSA, OKLAHOMA
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2
3
JONES
SUCKER RODS

Which one contains Olin ethanolamine *

*the one that's closest to you

(of course!)

Once you've established product quality, the ethanolamine that's closest to you is your best buy. A nearby source means dependability and convenience. That's why Olin distributors can so well serve gas purification installations.

When you need a shipment of ethanolamines, call one of the locations listed below. They have ample stocks (mono-, di- and tri-) in bulk and drums, ready for immediate delivery to your operation. For the name of distributors in other areas, for product specifications or samples, phone or write—
OLIN MATHIESON, Organic Chemicals, 745 Fifth Ave., New York 22.

L. H. BUTCHER CO., 3628 E. Olympic Blvd., Los Angeles 23, Cal. • WESTERN CHEMICAL & SUPPLY CO., 627 W. First St., Odessa, Tex. • WESTERN CHEMICAL & SUPPLY CO., P. O. Box 2175, Farmington, N. Mex. • WESTERN CHEMICAL & SUPPLY CO., 700 S. Locust St., Borger, Tex. • CHEMICAL SERVICE, INC., P. O. Box 1282, Oil Center Station, Lafayette, La. • RANGER CHEMICAL CO., 2000 Preston Ave., Houston 1, Tex.

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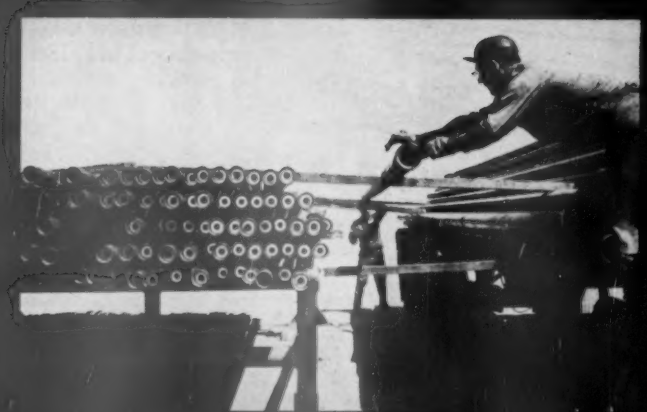
ORGANICS DIVISION Olin

Ethylene Oxide • Ethylene Glycols • Polyethylene Glycols • Propylene Oxide • Propylene Glycols • Polypropylene Glycols • Ethanolamines • Glycol Ethers • Surfactants • Ethylene Dichloride • Propylene Dichloride

Ask for these J&L tips

J&L SUPPLY



See how and why you can cut costs with J&L lease automatic custody transfer systems, Axelson rods, Cabot air balanced units, and J&L casing. Get the published data and weigh the facts! Sell yourself!

If it's sold by J&L . . . it's the best available. Call your local J&L Supply man for the latest literature, or write us at Tulsa, 1429 South Sheridan Road.

on production economy

Jones & Laughlin Supply Division « Tulsa

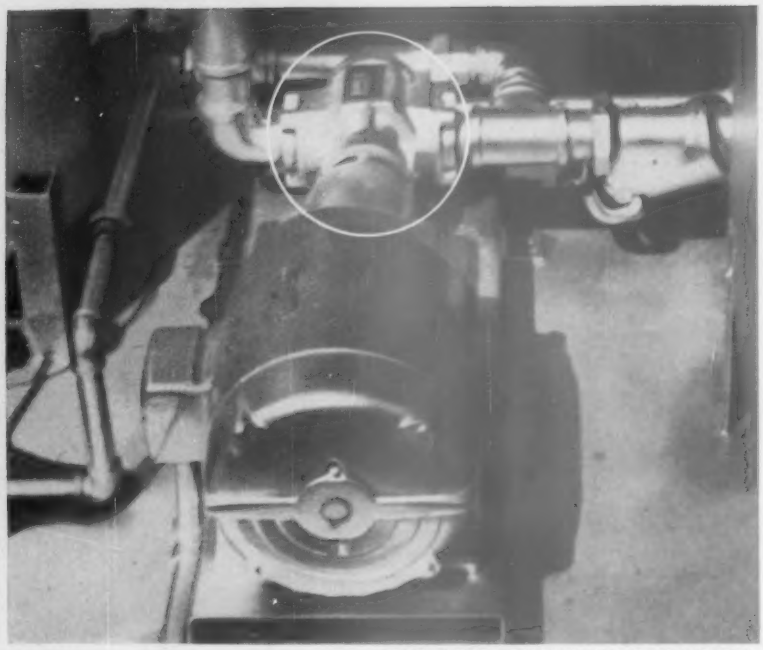


PHOTO COURTESY HY-BON ENGINEERING CO., MIDLAND, TEXAS.

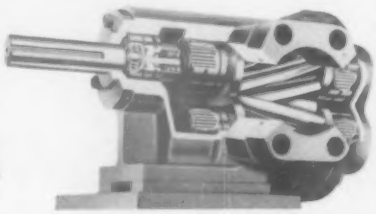
Brown & Sharpe Pumps cut costs four ways in L.A.C.T. units

1. Direct drive eliminates need for reduction equipment — means one less item to buy and service — less chance of breakdown.

2. Ceramic type mechanical seals last longer — require no adjustment.

3. Conversion for right- or left-hand rotation is easy. A B&S pump can be mounted to discharge either side . You just reverse a backdrain pin, when changing shaft rotation.

4. Dependability is built in through the use of close grain gray iron castings — hardened steel shafts and gears — heavy duty anti-friction bearings. Precision ground joints require no gaskets and hold internal clearances within precise limits. Replaceable wear plates and pipe connection flanges simplify servicing.



B&S Series 300 Rotary Gear Pump helps put the "automatic" in lease automatic custody transfer (LACT) systems.

Send for literature on B&S 300 Series and 700 Series petroleum-industry pumps. They'll save money and maintenance for you! Hydraulics Division, Brown & Sharpe Mfg. Co., Providence, R. I.

Brown & Sharpe
PRECISION CENTER

tion to further smooth downstream flow.

According to the manufacturer, tests of the dampener show the line pulsations reduced to less than 2% of the pulsations of the system without dampening.

The dampener comes in a wide range of sizes and pressure ratings, with screw connections for small piping and volumes, and with flanged connections for large piping and volumes. Source: **Hydril Co.**, 714 W. Olympic Blvd., Los Angeles 15, Calif.

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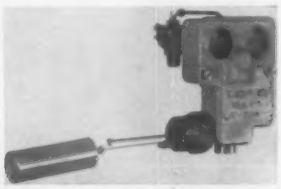


Float-operated pilot

A solid-displacement type float which is counterbalanced for normal or interface control is featured on this Model 400 PF pilot. Installed in a horizontal or a vertical position, the float drives a nonbleed, 30-psig. pneumatic relay through a "waggle" arm. One adjustment is provided for liquid level or interface level and one for proportional-band setting. The pilot is applicable for pressures to 4,000 psi. Source: **Kimray, Inc.**, 52 NW 42, Oklahoma City, Okla.

●

Trap closure operates easily

One man can operate this new scraper-trap closure, the maker says. A hinged type, the closure is designed with the cap or blanking plug threaded into a special fitting that is butt welded to the trap.

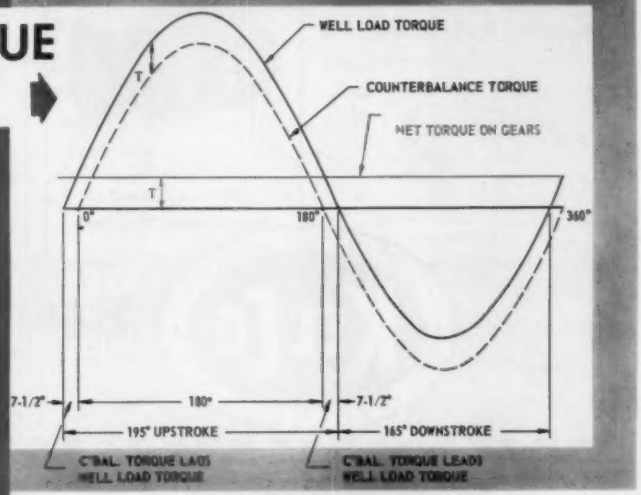
Supported by the hinge on the

SAVE ON POWER COSTS!

with LUFKIN'S MARK II UNITORQUE

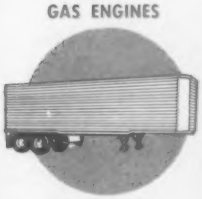
IT'S THE UNIFORM TORQUE That Does it!

- REDUCES PEAK TORQUE REQUIREMENTS UP TO 35%.
- LOWER PEAKS PERMIT USE OF SMALLER PRIME MOVERS.
- REDUCES ELECTRIC POWER COSTS WHERE CHARGES ARE BASED ON CONNECTED HORSEPOWER OR PEAK DEMAND.
- UNIFORM TORQUE INCREASES GEAR AND BEARING LIFE.

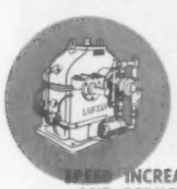


PUMPING UNITS

GAS ENGINES



TRAILERS



SPEED INCREASERS AND REDUCERS

HERE'S HOW . . .

By placing the pitman cross yoke forward of the vertical centerline of the crankshaft the upstroke occurs during 195° crank rotation and the downstroke 165°. This lowers the upstroke acceleration where the load is greatest, effecting a reduction of polished rod load.

The forward position of the cross yoke substantially increases the mechanical advantage for lifting the load and reduces the advantage on the downstroke where the load is less.

The counterbalance weights, being offset approximately 24° on the crank, produce a counterbalance torque which "lags" the well torque at the beginning of the upstroke by 7½° and leads the well torque by 7½° at the beginning of the downstroke. (See illustration above)

Independently, these features would not produce a uniform torque, but working together a "unitorque" system is obtained which in turn can effect a torque reduction on the gear reducer up to 35%.

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KELCO

CATHEADS

Spinning line and breakout models for any drilling, workover, or servicing rig. Anti-fouling spool. Positive control for air, hydraulic, or mechanical operation. For the safety of your crew and rig, specify KelCo Catheads.

Available Through Your Preferred Supply Store

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Model 16—Heavy Duty Spinning Line Cathead

Speeds Trip Time

Model 12—Medium Duty Spinning Line Cathead

Low Cost, Low Maintenance

TONG BLOCKS

Assure fast, safe makeup and breakout. Furnished with KelCo Catheads. Adapters for BJ or Web Wilson tongs.

Model 16—Heavy Duty Breakout Cathead

Prevents Extreme Shock Loads

Model 12—Medium Duty Breakout Cathead

Saves Rig Equipment

KELCO

Air-Operated
POWER SLIPS
Fulgrip
Tubing Tongs
Drill Pipe
Connection Blocks

Catheads
Power Slips
Tubing Tongs

BE SAFETY WISE
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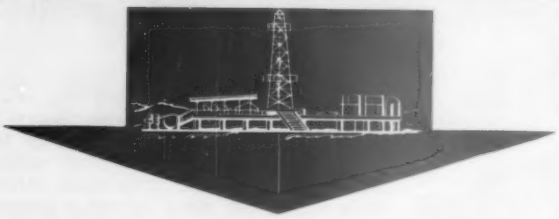

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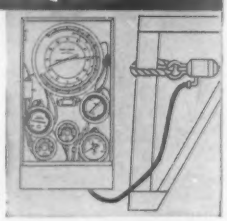
LOUISIANA'S OLDEST BANK

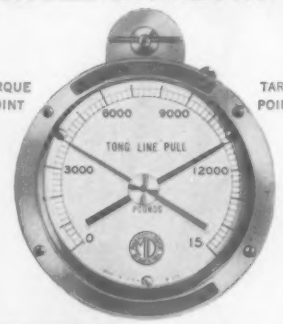
OIL AND GAS DEPARTMENT

ROBERT F. CASHEN *Assistant Vice President and Manager*

TONG TORQUE

THE MARTIN-DECKER TONG TORQUE ASSEMBLY FOR ALL CONNECTIONS



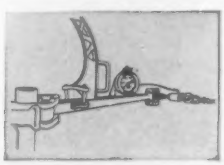


ONE GAUGE for torque measurements of all size drill collars, drill pipe, tubing and casing.

ACCURATE AND RELIABLE readings with calibration checks seldom required.

CARE AND MAINTENANCE can be capably done by the drilling crews.

PERMANENT INSTALLATION
The cylinder attached to the back-up line provides torque indication each time collars are run.



PORTABLE INSTALLATION
The torque assembly attached to the tong itself can be used for spot checks on two or more rigs.

MARTIN DECKER

WRITE FOR DESCRIPTIVE LITERATURE
MARTIN-DECKER CORPORATION, DEPT. P-6A
3431 CHERRY AVENUE, LONG BEACH 7, CALIF.

World's principal manufacturer of Oil Well Drilling Instrumentation

fitting, the cap can be easily swung into an open or closed position. A polished rod in the center of the cap fits into a bushing at the end of the hinge arm so the cap will turn freely when being threaded into or out of the fitting. An O-ring seals the cap. Lugs permit the cap to be tightened or loosened with a wrench or hammer. The closure comes in sizes from 8 to 38 in. in ASA 150, 300, 400, 600, and 900-lb. ratings. Source: **Well Equipment Mfg. Corp.,** Box 19465, Houston 24, Tex.

•

Paraffin scraper for flowing wells

When paraffin builds up inside flowing wells, this paraffin scraper may offer a solution. It consists of identical spring scrapers which are precision staggered on a mandrel so that the internal wall of the tubing will be completely stripped of all paraffin.

It's designed to be run on either a measuring line of a well-servicing sand line. The scraper springs are the only parts required for redressing the tool. They are easy to replace. Just unlock and remove the steel bar that runs through the hollow mandrel. Source: **Equipment Engineers, Inc.,** 2039 Amelia, Dallas 35, Tex.

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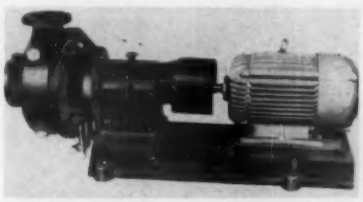
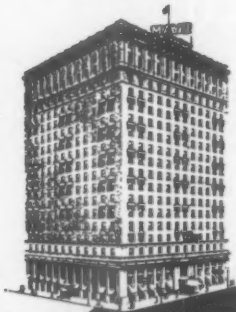


Steam-jacketed acid pump

Any solution which freezes above ambient temperatures, such as ammonium nitrate, liquid sulfur, and asphalt, can be pumped with this new steam-jacketed acid pump. Multiple steam-line connections are provided on the case, case plate, and the stationary seal-ring housing. Any two connections on each jacketed part can be connected to the incoming and return steam lines. They are tapped for ¾-in. pipe. Source: **A. R. Wilfley & Sons, Inc.,** P. O. Box 2330, Denver 1, Colo.

THE HOTEL



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600 Bright *Reasonably* Priced Rooms

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TULSA'S *Finest* HOTEL
Sample Rooms · Finest Food
Adjacent Garage

CORBAN
low-cost way to combat well corrosion

Corban® polar-type corrosion inhibitor is offered in 14 varieties to meet and combat both sweet and sour oil and gas well corrosion.

Corban is available in three forms: ready-to-use liquid, concentrated liquid, and sticks 18 inches long and 1½ inches in diameter. Some types of Corban are soluble in oil. Other types are soluble or dispersible in fresh water or brine.

Corban may be applied in any conventional manner, or by the Dowell-developed squeeze technique. Many operators depend on Corban for excellent results with low treating costs. Call your Dowell representative for full information.

PRODUCTS FOR THE OIL INDUSTRY

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DIVISION OF THE DOW CHEMICAL COMPANY

SUCKER RODS
SUFFERING FROM
MILL SCALE?
CONTINENTAL
HAS THE
ANSWER..
Worldwide!

Left on sucker rods, mill scale often becomes imbedded in the rod's surface when upsets are forged. There it is a target for corrosion attack and stress concentration, which cause premature rod failures.
Continental is the only manufacturer that blasts away these small flecks of mill scale before forging, as well as after. This unmatched quality control is one more reason why you can pump with confidence with Continental sucker rods.

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CONTINENTAL-EMSCO COMPANY, a Division of The Youngstown Sheet and Tube Company
General Offices: Dallas, Texas
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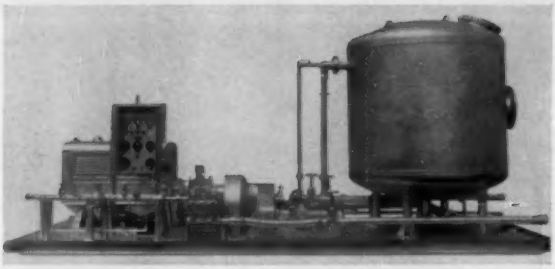
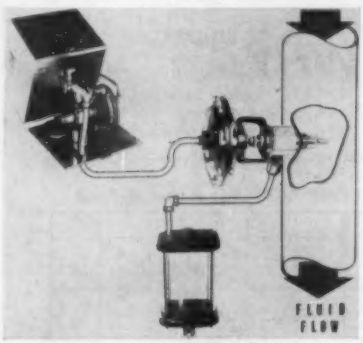


New packaged water-flood unit

RAW salt water is filtered, chemically treated, and injected into formations by this new packaged unit that can be used where electricity is not available for power. This prime mover may be an engine, or where electric power is available, a motor.

All equipment on the unit operates automatically and unattended. Two all-bronze centrifugal pumps handle the feed water and filter-backwash operation. A triplex plunger pump injects the water into the formation. Other noteworthy components include a chemical injector and central control panel. The feed pump and well-injection pump operate unattended and independently of each other. The backwash pump is manually operated and actuated by an on-off switch in the panel board. A natural-gas pressure of 50 psig. operates the chemical-injection pump.

A service feature of the master panel is that, if shutdown occurs, either lights or buttons will indicate the shutdown cause and which pump or pumps are running. Source: **Southern Engine & Pump Co.,** Box 1697, Houston, Tex.



500 samples taken per minute

Flow-line fluid can be sampled at rates from 10 to 500 samples per minute with this pneumatic-actuated liquid sampler, the maker says. It consists of three components: sampler valve, pulser, and sample container.

The valve screws directly into the flow line. The pulser applies and releases pressure on the valve diaphragm. This action reciprocates a ball in the valve between two seats. Each time the ball moves from one seat to the other, a fluid sample is taken.

A stainless-steel box houses the pulser which can be mounted on a vertical or horizontal line. Tubing connects the pulser to the sampler-valve diaphragm housing.

Operating at a pressure of 20 to 30 psi., the sampler is designed so the valve will handle pressures from 10 to 1,500 psi. Source: **Odex Engineering Co.,** Box 10177, Houston 18, Tex.

•

Dry acid with built-in indicator

A new acid has been brought out for acidizing oil, gas, repressuring, and disposal wells, to remove water-deposited scale, corrosion products, and slime, and to control pH that contains a pH indicator to show when the acid is spent.

The chemical reacts with most water-deposited scales and corrosion products to yield water-soluble end products that can be drained or flushed away. It is a dry, inhibited sulfamic acid which is said to be less corrosive than hydrochloric acid to metals commonly used where descaling is needed. It contains an inhibitor to prevent further metal corrosion. Source: **Cotey Chemical Co.,** Box 1239, Lubbock, Tex.

REDA DOES THE JOB BETTER AND AT LOWER COST!

For this flood project a Reda Submergible Electric Pump is in operation. It is one of the thousands of installations for which Reda Submergible Pumping Units were selected.

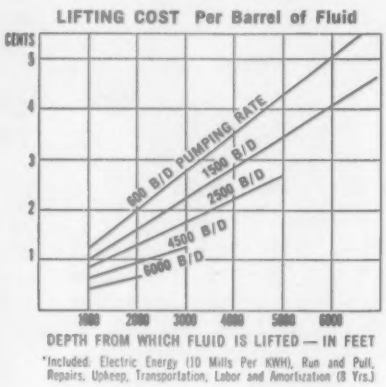
HERE'S WHY:

PROVEN PERFORMANCE

Over 80 million barrels of oil have been recovered profitably from wells which would have been abandoned as unprofitable producers.

PROVEN ECONOMY

Average cost of producing with Reda Submergible Pumps is less than one cent per barrel of fluid for each 1,000 foot lift.



*Included: Electric Energy (10 Mills Per KWH), Run and Pull, Repairs, Upkeep, Transportation, Labor and Amortization (3 Yrs.)

A COMPLETE LINE

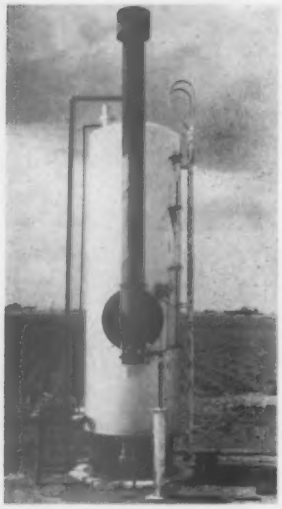
Reda Submergible Pumps are designed to meet every pumping need — for wells with small fluid volumes, large fluid volumes, new wells or secondary recovery operations. Daily production rates from 20 barrels of oil to 18,000 barrels of salt water producing less than 1% of oil. Depths of wells are from 450 feet to 13,000 feet. Complete line from ⅓ H.P. to over 300 H.P.

Write for Bulletin R-686 Today

SIGN OF QUALITY SUBMERGIBLE REDA PUMPS

REDA PUMP COMPANY / BARTLESVILLE, OKLAHOMA

Manufacturers of Submergible Electric Motors & Pumps for over 40 years
Pumps for Oil, Brine, Water, Gasoline, Jet Fuel, Chemicals, LPG



Compact treater for small leases

This Type G treater is designed to treat the oil from leases producing 100 to 700 bbl. per day. It comes in four diameters, 4, 6, 8, and 10 ft., with a shell length of 12 ft.

Since the treater has a relatively low over-all height, it can be upended and set with a single-axle truck. It is designed for an operating pressure of 50 psi., thus it may do away with the need for a separator on some leases.

An internal water leg and oil-overflow pipe simplify installation and protect these components from freezing. The treater valves are located together for ease in housing. Soruce: **Sivalls Tanks, Inc.,** Box 1152, Odessa, Tex.

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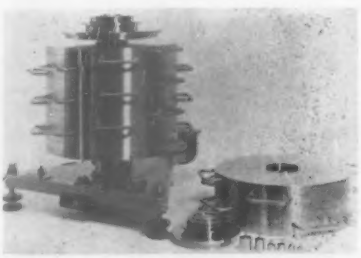

Dead-weight gage for 40,000 psi.

A master-pressure standard for the precise generation and measurement of pressures to 40,000-psi. is offered by a new dead-weight gage. The Model 2450 gage features nonmagnetic stainless-steel weights. Each weight is adjusted to match

the effective area of the piston-cylinder assembly and calibrated within 0.002% of Class S standard masses as certified by the National Bureau of Standards.

Pressure is measured from 60 to 40,000 psi. in 1-psi. increments. Accuracy of the gage is 0.01% or better, of the reading. The gage can be easily adapted to the calibration of gas-pressure systems or systems requiring special liquids by the addition of two differential-pressure indicators in the line between the gage and the system under test. Source: **Ruska Instrument Corp.**, 6121 Hillcroft Ave., Houston 36, Tex.

•

Metal-faced sheet insulation

Where a weather-resistant facing is required over insulation on outdoor tanks and other vessels, a new insulation system may meet the need. It combines an efficient insulation material with a diamond-ribbed sheet-aluminum facing.

Called Speed-Insul panels, the system promises a fast means to put on sheet insulation. It consists of insulation factory assembled with the aluminum facing and comes in sheets about 50 in. wide and 100 in. long, designed to provide a net insulation coverage of 4 by 8 ft.

The panels are fastened to metal surfaces using threaded studs welded to the surface to be insulated, and are predrilled for the studs. The sheets can be cut and drilled in the field with a sabre saw and hand drill. Source: **Johns-Manville, Insulation Div.**, 22 E. 40th, New York 16, N. Y.

Combine your Couplings, Welding Fittings, Flanges, Swage Nipples and Bull Plugs, Pup Joints, Sub Nipples, Sub Couplings, Weld Reducers, Caps and Saddles on one purchase order and take advantage of prepaid freight or freight allowance. Freight prepaid on combined shipments of 500 lbs. or more of the above items to one destination.

For this kind of service and savings, send all your orders to
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OSECO Silvertop Fusible Plugs with renewable inserts for all types OIL COUNTRY BOILERS.

STEEL FORGINGS, INC.
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Volcano Superior and Gulf States All Steel Gas Burners for OIL COUNTRY BOILERS.

WESTERN SAFETY BARREL STAND
Houston, Texas
Stand lifts, holds, tilts 55 gal. barrels. Prevents spillage—easily loaded.

WHEELING MACHINE PRODUCTS CO.
Wheeling, West Virginia
XL Steel Pipe Couplings for OIL COUNTRY TUBULAR PRODUCTS

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OIL WELL, REFINERY AND INDUSTRIAL SUPPLIES
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NEW TO THE OIL INDUSTRY!

THE SHAFFER "HYDRAULIC TRIP" JAR SAFETY JOINT

Positive "3-In-1" Protection Is A Major Advancement In Fishing Tool Design

Again Shaffer brings a major new oil tool advancement to the oil industry, a "3-In-1" Fishing Jar that combines, in one tool, the protection of a "Hydraulic Trip" Straight-Pull Jar . . . plus the protection of a *Mechanical* Trip "Standby" . . . plus the controlled releasing action of a positive Safety Joint in the event the fish cannot be loosened and it is desired to release the fishing string.

Never before has a single tool combining such a wide range of safety features been available to the oil industry!

1 USED AS A HYDRAULIC JAR

Normally used as a straight-pull "Hydraulic Trip" Jar, this new Shaffer tool permits the force of each blow to be easily controlled at the surface. The operator simply takes a pull on the fishing string. This pull, acting through a built-in hydraulic chamber, causes the desired blow to be struck as soon as sufficient fluid passes through an orifice in the tool—a matter of only a few seconds between the time the pull is taken and the blow is struck.

- The tool re-sets itself automatically when the string is lowered, and repeated blows can be struck by simply raising and lowering the string!
- No torque is required—either to strike the blow or to re-set the tool!
- The force of the blow can be easily controlled by noting the amount of pull registered on the weight indicator. To strike a heavier blow, merely increase pull. To reduce blow, take less pull. *It's that simple!*
- Once the desired pull has been determined, the entire operating sequence can be timed by the driller so there is no loss of time while tripping or re-setting the tool!

2 MECHANICAL TRIP STANDBY

If for any reason the "Hydraulic Trip" should fail to function, a simple manipulation of the run-in string by-passes the hydraulic system so that the tool can be operated *mechanically*. This is a marked improvement over other hydraulic Jars which become inoperative should the hydraulic system fail!

3 POSITIVE SAFETY JOINT RELEASE

Still another unique feature is the built-in Safety Joint in the lower portion of the tool. If the fish cannot be loosened, and it is desired to release the run-in string, simply trip the tool and apply left-hand torque as the string is slowly lowered. This rotates locking lugs into releasing slots so that the string and a major portion of the tool itself can be recovered. The recovered portion of the Shaffer "Hydraulic Trip" Jar Safety Joint can then be used at the bottom of any subsequent fishing string to simplify reconnection with the fish!

Ample Bore Diameter: So that wire line equipment can pass freely through the "Hydraulic Trip" Jar Safety Joint, it has been designed with a generous bore throughout its length. For example, the 5¾ O.D. tool has a full 2" bore!

Fully Oil-Sealed: To prevent abrasive mud, sand or corrosive well fluids contacting the mechanism, all operating parts of the Shaffer "Hydraulic Trip" Jar Safety Joint are completely sealed in oil!

(Left) **The Shaffer "Hydraulic Trip" Jar Safety Joint in "Set" Position**

See your nearest Shaffer representative for full details on this latest Shaffer advancement. Or write direct!

38 years OF OIL TOOL LEADERSHIP

SHAFFER

HIGH PRESSURE DRILLING AND CONTROL EQUIPMENT • FISHING TOOLS THAT EXCEL

SHAFFER TOOL WORKS, Brea, California • CALIFORNIA SERVICE SHOPS, Santa Fe Springs and Taft
HOUSTON, TEXAS, 9006 Navigation Blvd. • ODESSA, TEXAS, 1925 West Second Street
OKLAHOMA CITY, OKLAHOMA, Shaffer Tool Works, 6201 South Shields Boulevard
FARMINGTON, NEW MEXICO, Shaffer Tool Works, Post Office Box 1788
CASPER, WYOMING, Shaffer Tool Works, Post Office Box 827
HOUMA, LOUISIANA, Shaffer Tool Works, Post Office Box 1232
EXPORT SALES OFFICE, Shaffer Tool Works, 500 Fifth Avenue, New York, N.Y., U.S.A.
IN CANADA, Shaffer Western Hemisphere, Inc., 5823 103A Street, Edmonton, Alberta

Record drill time, bit weight

Two important variables in drilling a well, drilling time and weight, can be recorded on a new recorder now available. The Model G4W recorder makes it possible for drillers and operators to know the complete history of drill-bit weight, to verify formation breaks, and to have a guide in selecting drill-stem-test packer points and in selecting depths for spotting casing centralizers.

The recorder has a 4½-in.-wide chart. Drilling weight is recorded on a scale of 0 to 400,000 lb. A remote control on the recorder permits it to be operated from any position on the rig floor. Source: **Geolograph Oil Field Service Co.,** P. O. Box 1276, Oklahoma City, Okla.

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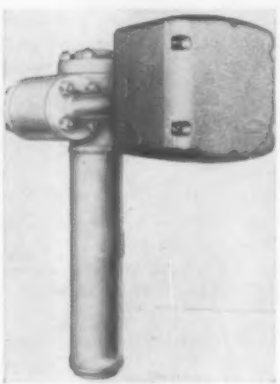


Transmitter for liquid levels

The accuracy of mechanical measuring and the efficiency of electronic signaling are claimed to be combined in this new liquid-level transmitter which transmits d.c. signals proportional to level variations. It's readily adaptable to all systems using electronic indicators, recorders, or controllers.

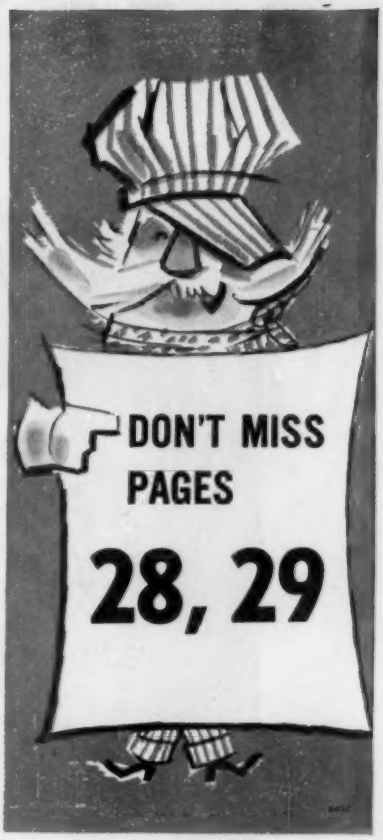
Reportedly accurate to within 1%, the level transmitter can be mounted in a left or right-hand position, and it can be reversed in the field. Fittings are available to adapt it to all types of liquid-containing vessels. Source: **Mason-Neilan Div., Worthington Corp.,** 75 Nahatan, Norwood, Mass.

•

Rotary hose for high pressures

Two new rotary hoses have been put on the market. The Type S-7500 is designed for use with working pressures to 4,000 psi. Type S-10,000 was developed for use in drilling where pressures exceed 4,000 psi. It is pretested at 10,000 psi.

According to the manufacturer, the hose is constructed so that all cables are at exactly the same angle and under the same tension so each cable will take its share of the pressure load. Source: **Goodall Rubber Co.,** 3550 W. 12th, Houston, Tex.



We bet millions on our couplings

When you buy a Fast's coupling, you can bet your bottom dollar everything was built on the spot, not assembled piece by piece from other suppliers. Koppers multi-million dollar manufacturing facilities are the most modern in the industry . . . with advanced program machines, highly accurate gear shapers, a complete forge shop.

For example, all Fast's Couplings are jig-drilled and jig-reamed for greater interchangeability of parts. Result: you get high-quality, smooth-running, long-lived units that are the choice of more equipment manufacturers than any other gear-type coupling.

KOPPERS COMPANY, INC., 1409 Scott Street, Baltimore 3, Md.

KOPPERS

FAST'S COUPLINGS

Engineered Products Sold with Service

A DP TRANSMITTER

212T TRANSCOPE® Indicating Flow and DP Transmitter gives you all the features you expect from a truly fine DP Transmitter . . . and the only one that can be calibrated linear with flow as well as differential pressure without changing parts.

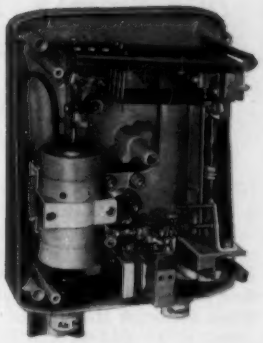
Taylor Instruments

OF MANY USES !

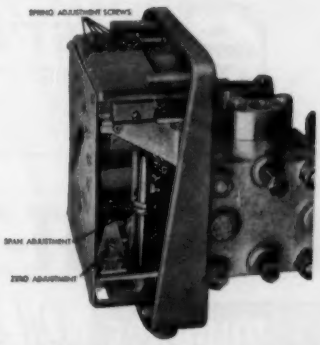
New Taylor 212T Transmitter is first and foremost a superior DP Transmitter . . .

Taylor's 212T TRANSCOPE® Transmitter is an outstanding example of "all this and heaven too". Basically it is a sound DP Transmitter, but when used for flow it can be calibrated to give a linear output without additional parts. It's available in indicating or non-indicating models. And with all its superior features *you pay no premium in price.*

Check the highlights listed here, then call your Taylor Field Engineer for a demonstration and write for **Bulletin 98413.** Taylor Instrument Companies, Rochester, N. Y., and Toronto, Ontario.



Open case design provides free access for maintenance.



Diagonally split case gives easy access for all adjustments.

Liquid-filled primary unit means:

Positive overrange protection. Hydraulic overrange protection to full body rating in *either* direction.

Isolation of internal parts. Working parts—except diaphragms themselves—are exposed only to non-corrosive silicone oil.

Built-in damping. Effective pulsation damping occurs at frequencies greater than approximately 2 cycles per second.

Exceptional rangeability.

Normal range span is 20 to 250" water. However, superior design and engineering quality permits over-calibration in either direction with good performance.

Mounting and connection versatility for any installation.

Process connections can be at top, at back or at bottom. ½" NPT fittings set on 2⅛" centers for convenience in piping directly to standard orifice flange taps. Universal mounting bracket can be secured to standard 2" horizontal or vertical pipe, or bolted to flat surface.

Good, clean mechanical design.

Diagonally split case makes all calibration adjustments easily accessible by simply removing cover. Zero adjustments can be made externally. Sturdy, protective case, designed for field locations.

PLUS

Servo power for square root extraction.

Produces an output directly proportional to flow or differential pressure . . . a cost-and time-saving feature when applied to computer control, or ratio and cascade control systems.

Servo power for indication accuracy.

Powerful servo relay drives tape movement to provide indication on a big 11¾" scale. It eliminates the necessity for externally mounted receiver gages.

Non-indicating model, showing rear mounting and bottom process connections.

MEAN ACCURACY FIRST

WHEN YOU NEED HELP IN A HURRY—

Koppers coupling service cuts costly down-time

Not every coupling service need is an emergency. But it's the emergencies that really test a good organization. That's why Koppers maintains experienced field engineers and outstanding stock facilities throughout the country. In addition, if it's a Fast's Coupling you're replacing, we have a serial number and specific application history for every Fast's for easy reordering. And our modern manufacturing facilities have the extra capacity to lick an emergency for special requirements.

Example: A modern windowless bank in Georgia was able to open for business as usual only because Koppers flew in a completed replacement coupling for its air conditioning unit. Elapsed time . . . request phoned to Baltimore after 10 in the evening . . . coupling arrived before 7:30 next morning.

KOPPERS COMPANY, INC., 1409 Scott St., Baltimore 3, Md.

KOPPERS

FAST'S COUPLINGS

Engineered Products Sold with Service

SAUDER HT-TREAT PAK

Oil Emulsion Treater

ALL-PURPOSE ECONOMY for Toughest Treating Problems!

Sauder's HT-2 incorporates new design developments that assure automatic — fool-proof — operation — under all climatic conditions!

MEETS ALL OIL EMULSION TREATING REQUIREMENTS!

■ Operates as pressure treater — with or without gas. ■ Changes from gas to hydraulic delivery — without manual adjustment. ■ Handles water flood operations ideally. ■ Treats very toughest emulsions — with top economy!

New concept in furnace design minimizes coking, scaling, corrosion, and firetube burn-out — and, thanks to new method of heating directly in the oil — little (or no) heat is dissipated to free water!

TREAT PAK — PLUS INSTALLATION — COST LESS THAN OLD-STYLE EQUIPMENT! All controls and piping assembled at factory! Only four field connections required! Skid-mounted for fast — flexible — installation!

Sauder

Write or phone us today for full information!

SAUDER TANK CO., INC., Phone DI 2-2550, Emporia, Kansas

"Originator of 'ECONO-PAK & UNIDRYER'."

What's New

. . . in literature

High-pressure mechanical seal

Details on a new mechanical-seal development for pressures from 600 to 2,000 psi. are offered in new Bulletin 492, now available free. The seal, called the HPTO high-pressure dura-seal, has found successful application on product pipeline pumps, salt-water injection pumps, boiler-feed pumps, and high-pressure refinery pumps handling LPG. Source: **Durametallic Corp.,** 2104 Factory, Kalamazoo, Mich.

Automatic control equipment

A variety of automatic control equipment is described in Catalog 18-B now available. The catalog's four sections detail automatic transfer switches, contactors, special controls, and timing devices. They describe the product's applications, construction details, operating features, and list prices, and present selected wiring diagrams. Source: **Zenith Electric Co.,** 152 W. Walton, Chicago 10, Ill.

Steam-trap selection

Helpful data on steam trap selection are offered in a quarterly publication now available, Sarcoscope, Vol. 1, No. 3. The 12-page publication includes a feature article, "Operating Load Factors in Steam Trap Selection," which should be useful in selecting traps by pipe size, regardless of the true discharge capacity of the trap. Source: **Sarco Co., Inc.,** 635 Madison Ave., New York 22, N. Y.

Ductile-iron pipe fittings

An illustrated 12-page catalog on a line of ductile-iron pipe fittings can be obtained free. Catalog No. PF shows available stock sizes and prices for screwed fittings with ratings from 300 to 2,000 psi., pipe-lock couplings for 400 and 800 psi., flanges and fittings in the 150 and 300-lb. class, and hexagon bushings and plugs. It gives data on strength, ductility, impact resistance, low-temperature transition, corrosion resistance, and suggests typical appli-

Short and compact, the Halliburton R-3 retrievable Packer is designed to withstand up to 5,000 psi working pressure differential for use in treating, fracturing, testing, water flooding, and producing wells. It is available for use in casing sizes ranging from 2⅞" O.D. through 7" O.D.

Its simple design provides economical, easy operation whether used as a tension packer, or when inverted, as a compression set casing wall packer. Being a retrievable tool, it may be set and re-set during one trip in the hole . . . or moved from well to well. Full-opening mandrel allows running wireline devices. A safety joint and other safety features provide for release of the drillable packer if well conditions should make it necessary.

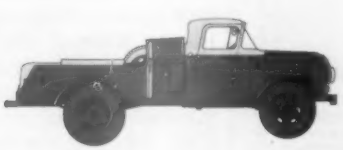
OPERATING FEATURES

Used as a tension packer – the Halliburton R-3 Treating Packer requires no hold-down when resisting pressures from below. The packer is set simply by running it to the desired depth, making a ¼ turn to the right and picking up on the tubing. This sets the slips and expands the 75 durometer packer rubber inside the casing. To unseat quickly, lower the tubing to release the packer and automatically lock it in a retracted position.

Used as a conventional hook wall packer – the inverted Halliburton R-3 Treating Packer is designed to hold pressures from above or below. When using the packer this way, the tubing is attached to the lower end of the mandrel assembly and run to the desired depth. The usual tension operating procedure is reversed to seat or unseat the packer. Using a Halliburton Hydraulic Tubing Hold-Down – either round slip type or the larger rectangular slips for higher pressures from below the packer – helps prevent upward movement of packer.

This *two-in-one* packer performs many functions at low cost. Call your Halliburton man to make sure R-3s are used in your operations.

275 Service Centers
. . . just minutes away from your well



SPECIAL TOOLS SERVICES

Halliburton
COMPANY . DUNCAN, OKLAHOMA

cations. Source: **Kuhns Bros. Co.,** 1800 McCall, Dayton, Ohio.

Oil-field pumping engine

Two models of an oil-field pumping engine are featured in a data sheet now available gratis. Called the Wind Wheel, the engine is available in both 4 and 10-hp. sizes, with one and two cylinders respectively. According to the data sheet, the engine is air-cooled, operates at speeds from 600 to 1,200 r.p.m., and can be used to drive both downhole and pipeline pumps, as well as pumps for disposal wells. Source: **Holtkamp Electric Service Co.,** 2338 Lemay Ferry Rd., St. Louis 25, Mo.

Air-water-operated boring machine

Holes with diameters from 2 through 24 in. and up to 250 ft. long can be bored for pipelines with an earth-boring machine described in a new 16-page booklet. The booklet describes and presents the specifications on the Hydrauger line of earth-boring machines. And it includes operating instructions and a parts list. Source: **Hydrauger Corp., Ltd.,** 681 Market, San Francisco 5, Calif.

Electronic welding equipment

Details on equipment for precision welding of small parts and thin metals are offered in this four-page short-form catalog. According to the catalog, the products are capable of accomplishing virtually any delicate, demanding, or difficult application. The products described include power supplies, welding heads, and welding handpieces. Source: **Hughes Aircraft Co., Vacuum Tube Products Div.,** 2020 Short, Oceanside, Calif.

Glass-fiber safety ladders

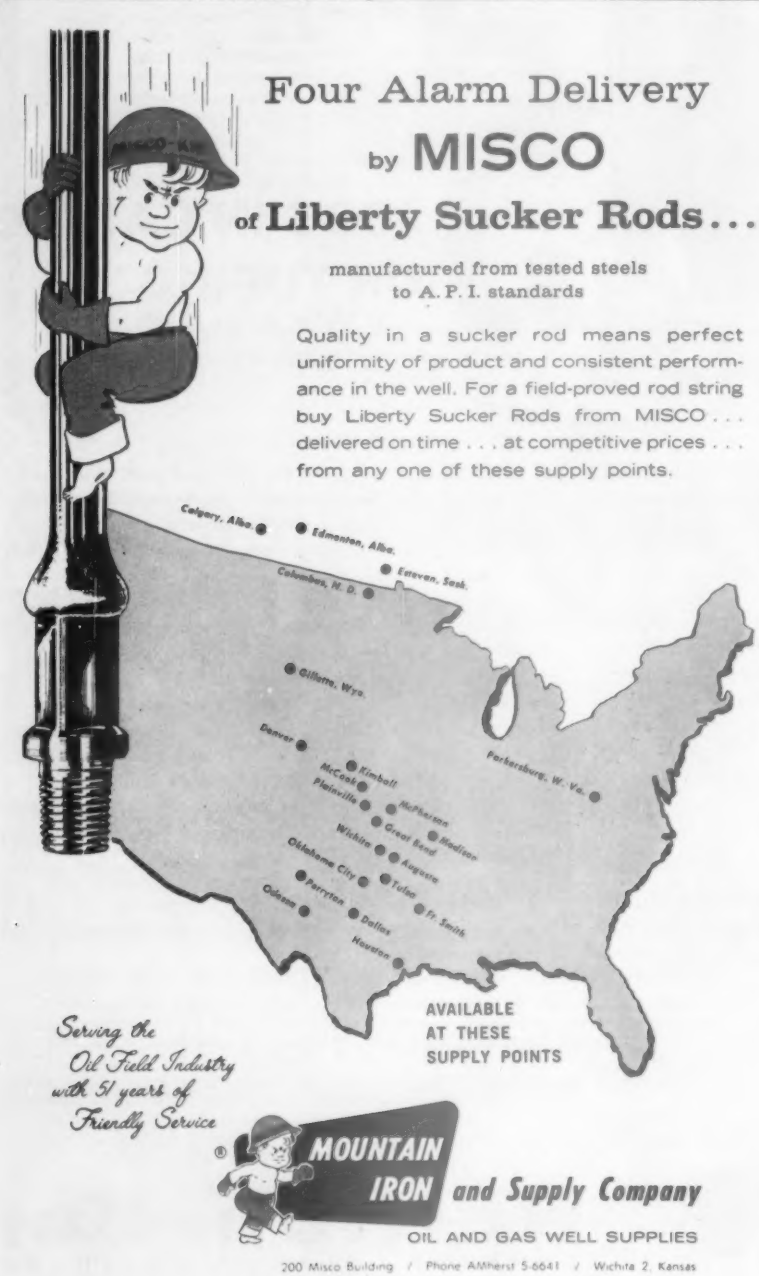
This 10-page folder gives the details on a line of safety ladders available in straight, extension, platform, and extension types. Features include glass-fiber rails and aluminum rings. The four-in-one combination ladder can serve as a conventional stepladder, pushup extension ladder, or as a straight ladder. Source: **Hopfeld Industrial Mfg. Co.,** P. O. Box 54, San Rafael, Calif.

Flow-ratio-control basis

Flow-ratio control is used where one flow rate must be maintained in definite proportion to another uncontrolled flow rate. New four-page Bulletin 91-10-01 explains the four common forms of flow-ratio control and clarifies them with simple schematic diagrams. A full-page chart sets forth the flowmeter and other instrument requirements. Source: **Fischer & Porter Co.,** 936 Jacksonville Rd., Warminster, Pa.

PVC pipe and fittings data

How do you install rigid unplasticized polyvinyl chloride pipe and fittings? An 8-page booklet is now available for the asking that includes both specifications and installation data on a line of PVC pipe and fittings. Charts show maximum working pressures at raised temperatures for both normal and high-impact PVC pipe, recommended support


Four Alarm Delivery
by MISCO
of Liberty Sucker Rods...
manufactured from tested steels
to A. P. I. standards
Quality in a sucker rod means perfect uniformity of product and consistent performance in the well. For a field-proved rod string buy Liberty Sucker Rods from MISCO . . . delivered on time . . . at competitive prices . . . from any one of these supply points.
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AVAILABLE AT THESE SUPPLY POINTS
Serving the Oil Field Industry with 51 years of Friendly Service
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spacings for pipe installations, and corrosion resistance of PVC to 352 chemical elements and compounds. Other useful information contained includes data on joining techniques, expansion and contraction, and threading. Source: **Consolidated Pipe Co. of America,** 1066 Home Ave., Akron 10, Ohio.

Sealless pumps

Bulletin 1100-1 (four pages) illustrates and describes the maker's complete line of sealless, leakproof pumps. It covers design, operation, and selection of canned pumps. Source: **Chempump Div., Fostoria Corp.,** Huntingdon Valley, Pa.

Indicating gages

Bulletin 321.11 presents 12 pages of comprehensive data on Rockwell-Republic V5 gages. The bulletin gives descriptions of the compact, easy-to-read gages for indicating draft, pressure, differential gas pressure, and temperature and pneumatic impulses from transmitters. Source: **Republic Flow Meters Co.,** 2240 Diversey Parkway, Chicago 47, Ill.

Computer-calculated fracturing treatments

This six-page folder discusses computer-calculated fracturing treatments based on the Frac Guide, Dowell's method of engineering fracturing treatments. The literature explains benefits to be derived with the Frac Guide, tells what the computer does and how it is used. Included are photographed forms for use with the service, a data input sheet, data forms, and an analysis form. Source: **Dowell Division of the Dow Chemical Co.,** Box 536, Tulsa, Okla.

Self-sealing couplings

Handy, 20-page Bulletin 629 is devoted to a general discussion of basic applications possible with self-sealing couplings. It's well illustrated with simple, easy-to-understand drawings, and was prepared chiefly to acquaint you with general information rather than with specific details. A typical example is a section explaining how self-sealing couplings can replace two shutoff valves to maintain pressure in a hydraulic system or prevent fluid drainage from the system. Source: **Aeroquip Corp.,** 300 S. East Ave., Jackson, Mich.

Spark-ignition conversion kit

The conversion kit for converting Series 71 GM diesel engines to operate on natural gas is detailed in a new four-page folder, obtainable for the asking. The kit can be used on both current and older Series 71 diesels. Source: **Stewart & Stevenson Services, Inc.,** 4516 Harrisburg Blvd., Houston 11, Tex.

By-pass rotameters

How measurement and control of flow rates in pipe sizes as high as 48 in. can be done economically is described in new Bulletin 116. It was prepared especially for engineers and designers who want complete information about capacity determination, flow range data, piping requirements, accuracy, and other engineering details concerning the use of rotameters in by-pass arrangement. Source: **Brooks Instrument Co., Inc.,** Hatfield, Pa.

What makes the first gear-type coupling still first choice?

Check design . . . and you'll find Fast's Couplings (the original gear-type couplings) are superbly engineered, ruggedly built, smoothly running units designed to outlast the machines they connect.

Check completeness of line . . . and you'll find Fast's Couplings come in a complete range of sizes and types for shafts from ½" to 32" and larger.

Check service . . . and you'll find Fast's Couplings are backed by expert help from experienced field engineers . . . while outstanding stock facilities throughout the country insure speedy delivery of your coupling orders.

Check popularity . . . and you'll find Fast's Couplings are the choice of more industrial equipment manufacturers than any other shaft coupling.

Check Fast's for your coupling needs today.

KOPPERS COMPANY, INC., 1409 Scott St., Baltimore 3, Md.

KOPPERS

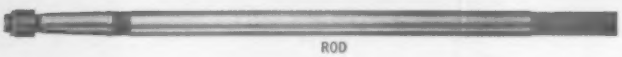
FAST'S COUPLINGS

Engineered Products Sold with Service

The Mission Mission

LINER

PISTON

Mission  Mission

ROD

LINER PACKING

Mission and Mission

GLAND PACKING

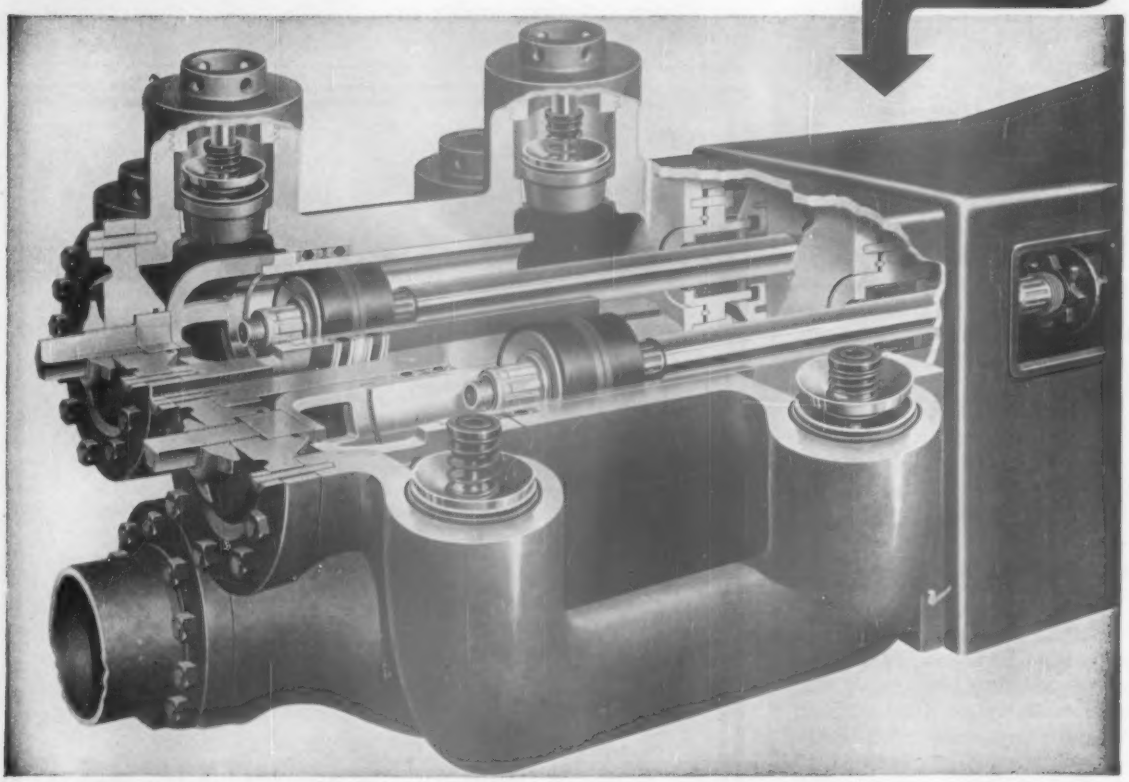
VALVE & SEAT

are all designed and made in our

modern to work

PLANT

together to cut your drilling costs.



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MISSION MANUFACTURING CO.

▶▶▶ Equipment Men Notes

Z. C. Ambrose named general sales manager for Bowen Itco

Z. C. Ambrose

. . . according to Fred N. Osmun, president of the Houston-based fishing and specialty-tool-manufacturing firm. In his new position, Ambrose will direct and administer all sales activities of Bowen's 21 domestic sales outlets, along with the company's export sales network throughout the free world.

With more than 25 years experience in the petroleum industry, Ambrose goes to Bowen Itco with a broad background as an engineer and executive with Associated Oil & Gas Co., Southwest Gas Producing Co., Chicago Corp., and Continental Oil Co. His most recent position was as executive vice president of Houston Oil Field Material Co.

Robert P. Barnett made v.p.

. . . of Atlas Chemical Industries, Inc. (formerly Atlas Powder Co.), of Wilmington, Del. He will continue to serve as general manager of the International Division, a position he has held since 1959. Barnett joined Atlas as senior legal assistant in 1951 and became assistant to the senior vice president in 1958.

Dresser elects John Cartwright

. . . as vice president, Machinery Group, with headquarters in Dallas. Cartwright goes to Dresser Industries from Joy Mfg. Co., where he was a vice president and general manager of the Industrial Division. At Joy he had previously served as district sales manager and sales manager of the Industrial Division.

T. S. Bushnell is promoted

. . . to the new position of sales manager, special products, for Tube Turns Plastics, Inc., Louisville manufacturer of injection-molded fittings and other components for plastic piping. James L. Sheehy was named to succeed Bushnell as Midwest district manager in Chicago, and Cliff M. Springmeier to succeed Sheehy as West Coast northern district manager in San Francisco. The changes were announced by Earl A. Erich, vice president and sales manager.

Bushnell joined the affiliate of Chemetron Corp., in 1955 as Midwest district manager. In his new post he will locate in Louisville. Sheehy started with TTP in 1956 and became the company's first West Coast district manager the following year. Springmeier joined TTP last February as a sales engineer in Louisville.

Core Laboratories, Inc. creates three division-manager posts

R. S. Bynum

Rufe S. Bynum, former district manager of West Texas-New Mexico, takes over as Mid-Continent division manager for Central U. S. operations. He will continue to maintain his office and residence in Midland. Sam B. Dunlap, formerly manager of sales, has been appointed Gulf Coast division

S. B. Dunlap

J. D. Harris

manager for the entire Gulf Coast and southeastern states regions. Dunlap will transfer from Dallas to Houston. James D. Harris, district manager of Rocky Mountain operations, will assume the management of a western division covering the mountain states and California. He will continue to locate in Denver.

At the same time, the Dallas-based petroleum-reservoir-engineering firm announced the transfer of J. W. Barbour, Jr., from Maracaibo, Venezuela to Dallas, where he will be in charge of overseas and special sales assignments. Barbour will continue as president of Core Laboratories International, S.A.

Republic Supply Co. appoints two new vice presidents

. . . according to W. J. McWilliams, president. New vice president in charge of operations and directing the activities of all Republic supply

Jerry Bergin

Jack Wright

districts, stores, and sales offices is J. C. Bergin. Bergin has been with Republic since 1948, serving in various capacities. From 1956 to 1959 he was manager of the Kansas district, and from 1959 to the present he served as South Louisiana district manager.

Jack R. Wright is the newly named vice president in charge of sales. In this post he will coordinate and plan sales programs for both oil field and industrial lines. Wright served several years as vice president of Murray-Brooks, Inc., in charge of the Houston office. He joined Republic Supply last February as manager of project and industrial sales. Both men will locate at Republic Supply's Oklahoma City headquarters.

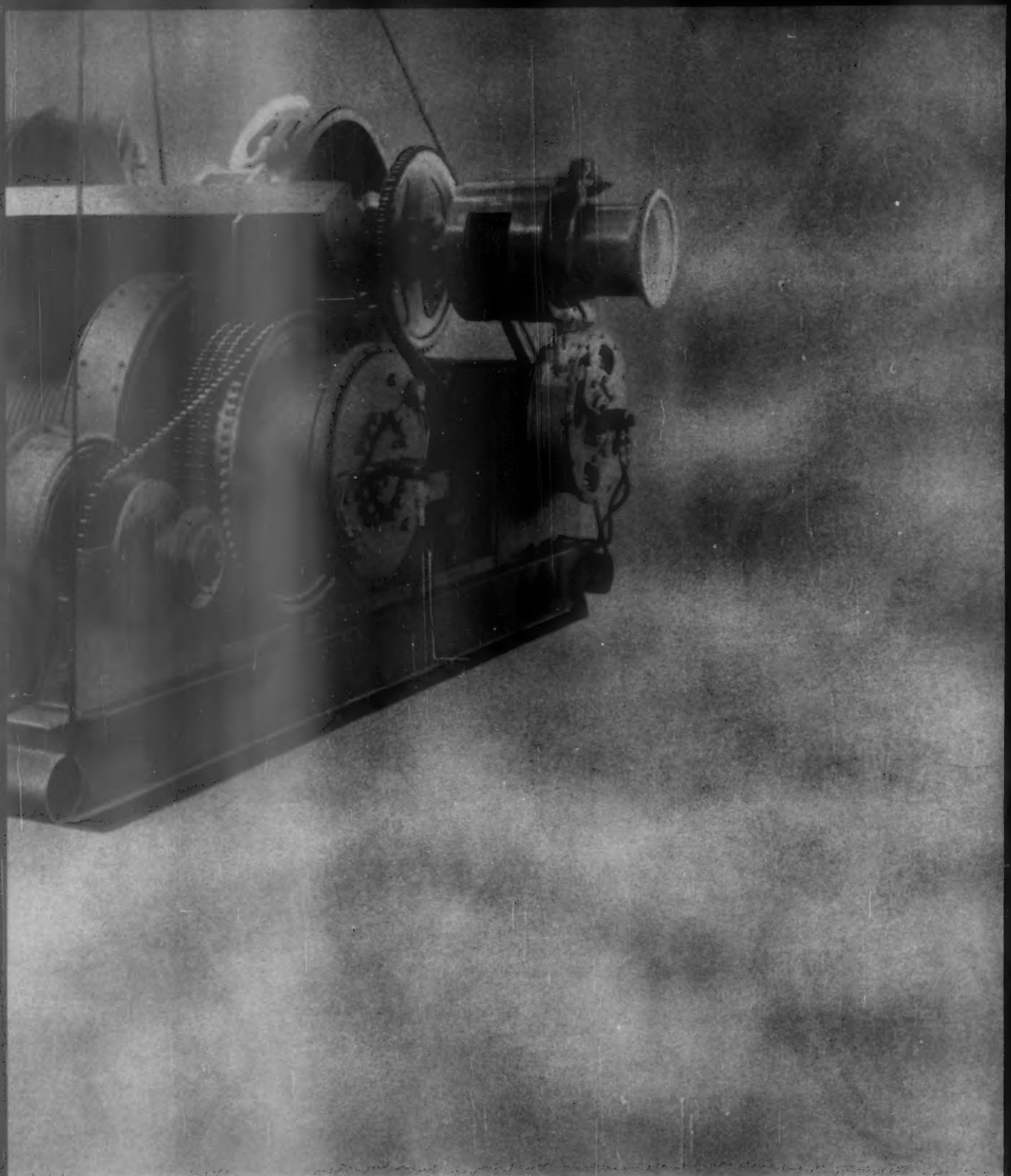
Thompson Ramo Wooldridge promotes Ray J. Stanish

. . . to general sales manager for TRW Computers Co., in which post he will supervise sales of TRW computers throughout the United States and Canada. Prior to his promotion Stanish was central regional sales manager in charge of TRW Computers' Chicago office. Previously he was chief engineer, TRW's Replacement Division. Later, as manager of central staff placement, he was responsible for recruiting professional personnel.

Parker-Hannifin Corp. appoints

. . . John W. Tuohy as sales engineer for industrial pneumatic and hydraulic products, according to T. H. Thoresen, western sales manager. Tuohy joins the Chicago staff under the direction of D. A. Has-

Sikorsky S-64 Skycranes will carry loads 4½ times



greater than any helicopter in commercial service today.

The Skycrane, now being built, is a completely new helicopter specifically designed for lifting heavy loads. It will pick up and deliver nine tons of you-name-it . . . or carry field offices, tool sheds, kitchens, or nearly any other field unit in interchangeable pods. The Sikorsky Skycrane has power and versatility plus. Send for the complete story today.

Sikorsky Aircraft

Division of UNITED AIRCRAFT CORPORATION, Stratford, Connecticut

tings, regional manager in the Parker-Hannifin sales office in Des Plaines, Ill. Previously Tuohy was with Wilton Tool Mfg. Co., Schiller Park, Ill., where he served as assistant sales manager.

Geophysical Service, Inc. moves gravity department to Dallas

R. H. Rainey, manager of U. S. and Canadian operations for the Dallas geophysical exploration firm, said that the gravity department will occupy offices at 7218 Harry Hines Blvd. Dr. Richard A. Geyer is manager of gravity operations for GSI. He will continue in this position at the new Dallas location.

Anthony G. Baragona becomes

. . . advertising and public relations manager for Bendix Computer Division, in Los Angeles. He joined the division 2 years ago as assistant advertising and public relations manager. Baragona was previously with General Electric's computer department in Phoenix.

Wendell Cooper to supervise J&L data-processing section

Wendell Cooper

. . . according to an announcement by R. J. Woods, Jr., assistant to the president of Jones & Laughlin Supply Division. Cooper joined J&L 15 years ago as supervisor of the printing department. He was advanced to office manager in 1954, the position he held until the present.

N. J. Barnard is promoted to vice president of DEMCO

Drilling Equipment Mfg. Co., Oklahoma City, announces the elevation of N. J. Barnard to vice president and a member of the company's board of directors. Formerly assistant general manager, Barnard's primary duties will continue to be directed in that capacity. A veteran of 13 years with DEMCO, Barnard first joined the staff as plant superintendent.

Atlas Bradford Co. appoints three district sales managers

L. T. Shackelford

. . . it was announced by W. T. Pearson, vice president in charge of sales. L. T. Shackelford is the new Houston district sales manager and will operate out of the company's home office in Houston. Shackelford has been in oil-field sales in the Houston area since 1946, and with Atlas-Bradford the past year.

W. L. Phillips

R. E. Bartelsmeyer

W. L. (Bill) Phillips has moved from Houston to Lafayette to assume new duties as Louisiana-Mississippi district sales manager. Phillips has been in sales with the company for 5 years, covering Canada, Louisiana, Mississippi, Arkansas, Oklahoma, and Kansas. New district sales manager for West Texas is Roger E. Bartelsmeyer. Bartelsmeyer, who has served with the organization the last 6 years in Corpus Christi, will headquarter in Odessa.

Swartwout Div. of Crane Co. appoints Aljo Sales, Inc.

. . . as exclusive representative in the Tulsa area. Aljo Sales was organized in 1956 primarily to serve the instrument and electrical needs of Oklahoma, the Texas Panhandle, Kansas, and western Missouri. President A. J. Grasgrin has sold electrical equipment for 12 years. John H. Elsloo has been a sales engineer in the Tulsa area the past 3 years, and prior to this was engaged in refinery and petrochemical construction in the Tulsa area.

Griscom-Russell Co. purchases

. . . exclusive rights to manufacture and sell deaerating heaters using designs and patents of Elliott Co., of Jeannette, Pa., a division of Carrier Corp. Griscom-Russell and its affiliate, C. H. Wheeler Mfg. Co., Philadelphia, manufacture heat exchangers, feedwater heaters, condensers, pumps, and seawater distilling plants.

McKnight to handle Dallas office for Daniel Orifice Fitting Co.

As district sales representative, B. C. McKnight will serve customers in the Northeast Texas area. He has had 10 years experience at Daniel in production, engineering, and sales. Daniel, manufacturer of flow-measurement products, has headquarters in Houston.

AviSun Corp. appoints Joseph Hanlon as advertising manager

Prior to joining AviSun, Hanlon was advertising and sales promotion manager of Crown Cork & Seal Co., Inc., with whom he was associated for 23 years. AviSun is an equally owned affiliate of American Viscose Corp. and Sun Oil Co. Established in 1959, the Philadelphia company manufactures and markets polypropylene resin, film, and fiber.

Travis W. Brown becomes manager of field operations

. . . for Geolograph Oil Field Services. He has been with the Geolograph organization in various capacities since 1952, beginning as a field representative. At the time of his present appointment, he was in charge at the company's manufacturing division. Brown will direct operations of Geolograph's 19 district offices from headquarters in Oklahoma City.

Vernon M. Barber takes over

. . . as sales promotion manager for Hills-McCanna Co., Carpentersville, Ill., according to R. F. Dauenhauer, general sales manager. Barber, formerly district manager for Hills-McCanna in the Gulf Coast area, has been with the company for 10 years in various sales capacities.

DATA ON
ACTIVE FIELDS

Cha Cha and Totah fields San Juan County, New Mexico

1. Approved field names: Cha Cha and Totah fields. Location: Northwest New Mexico in San Juan basin.

2. Discovery wells: Cha Cha—Benson-Montin-Greer 2 Jones SW NE 17-28n-13w, San Juan County, IP 132 BOPD from Gallup at perforations from 5,323-76 ft., discovered September 1959. Totah—Tenneco Oil Co. 8 Glenn Callow SW SE 27-29n-13w, IPF 514 BOPD at 5,195-5,247 ft., discovered in 1959.

3. Trend of development: Northwest-southeast.

4. Number of producing wells: Cha Cha 70. Totah 47.

5. Spacing pattern: General pattern is 80 acres. In northwest sector of Cha Cha, some wells are drilled on 160-acre units.

6. Proved acreage: Cha Cha 8,320. Totah 2,680.

7. Principle operators: Cha Cha—Aspen Crude Purchasing Co.; Aztec Oil & Gas Co.; Benson-Montin-Greer Drilling Corp.; El Paso Natural Gas Products Co.; Humble Oil & Refining Co.; Pan American Petroleum Corp.; and Tenneco Oil Co. Totah—Aztec; E. E. Elliot; Pan American; Southwest Production Co.; and Tenneco.

8. Present allowable: 164 BOPD per 80-acre unit.

Drilling Operations

9. Number of active drilling rigs: 8.

10. Casing program: 9⅝ of 8⅝-in. set at 160 ft. with 200 sacks cement. 5½ or 4½-in. oil string set at T.D.

11. Average drilling time per well: 13 days.

12. Types of drilling fluid: Gel-base with approx. 5% oil. Some native mud is used along with low-solids mud and oil.

13. Completion methods: Perforate casing and fracture treatment.

14. Types and sizes of bits: 11 rock bits either 8¾ or 7⅞-in.

15. Special drilling problems: Some lost circulation while drilling Gallup pay zone. Certain shales react to wetting and swell.

Geology

16. Producing formations: Cha Cha—Upper Cretaceous-Gallup at 5,300-5,600 ft. Totah—Upper Cretaceous-Gallup at 5,150-5,250 ft. Cretaceous-Dakota at 6,100-6,200 ft. Ten wells at Totah are dually completed from Gallup and Dakota.

17. Reservoir characteristics: Type drive is solution gas. Gas-oil ratio is from 1,500 to 2,000:1.

18. Geologic markers: Pictured Cliffs sandstone 1,200 ft., Lewis shale 1,400 ft., Point Lookout sandstone 3,800 ft., Gallup sandstone 5,300 ft., and Dakota sandstone 6,100 ft.

19. Type trap: Stratigraphic lenticular sands associated with a monocline.

20. Core data: Porosity 12-16%, permeability 57 md. (ave.), residual-oil saturation 30%, total water saturation 35%, cored interval 50 ft. (Gallup), average net ft. of pay is 8 ft. in upper sand and 10 ft. in lower sand.

21. Estimated recovery: 91 bbl. per acre-ft.

22. Pressures: Initial reservoir pressure is 1,600 psig. and surface is 300 psig.

23. Tests and logging procedures: DST Gallup, Es-Induction log 160 ft. to T.D. Sonic of Microlog through Gallup pay, and Gamma ray log for correlations.

24. Pipeline outlet: Four Corners Pipeline.

25. Exploration methods before discovery: Seismic, gravity, and subsurface geology.

26. Average costs: Dry hole $35,000. Flowing well $57,000. Pumping well $65,000. Average total depth 5,500 ft. Note: Turnkey price to casing point is $26,000. Footage rate $3.35. Day-rate with pipe is $850. Average lease price is $25 to $50 per acre.

27. Crude analysis: 40° API, 0.12% sulfur, 36.2 viscosity at 100° F. S.s.U., pourpoint 22° F., b.s. and w. 0.3%.

28. Yield data:

Product	%	Vapor temp., °F.	Gravity
Naphtha	40.5	to 400	57.18
Middle dist.	20.2	to 602	38.10
Lube dist.	34.2	to 940	28.00
Residue	5.1	.....	....
Loss	0	.....	....

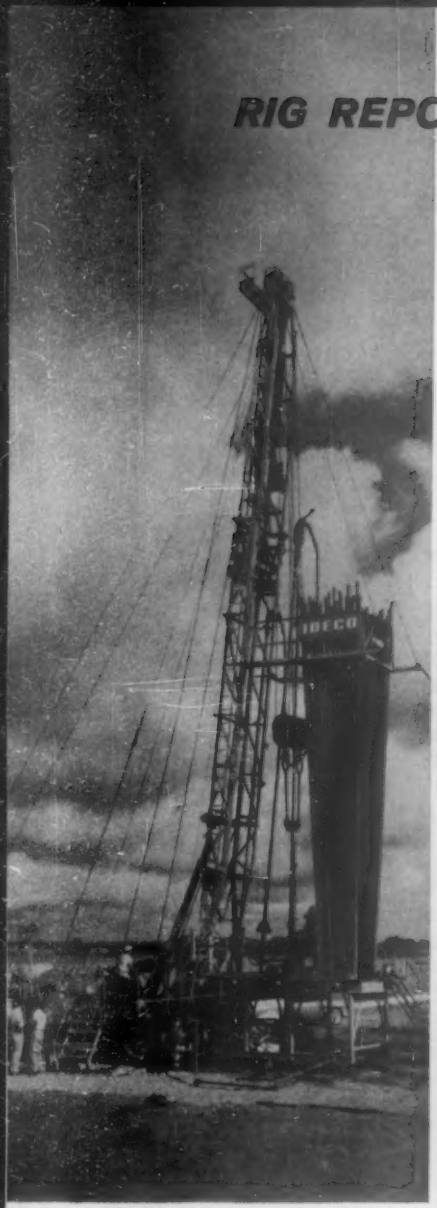
Italians get special course

A SPECIAL THREE-DAY course in air and gas drilling techniques was presented to Italian engineers at San Donato Milanese. The short course, first of its kind ever offered in Italy, was sponsored by Institute Direzionale e Tecnico.

Topics covered included a review of techniques used in air and gas drilling, compression equipment available, and problems of circulating a gaseous fluid. Robert W. Sneed, president of AIRDRILL International, Inc., Denver, used visual aids and an interpreter in presenting the course material.

The institute was opened by ENI, the national oil company, in 1958.

RIG REPORT



FOR SERVICING AND WORKOVER

... In the fields of South Texas, this Ideco Drive-In Rambler is equipped with an Ideco DUAL SPEED SYSTEM which saves 30 to 50 percent of the time usually required to pull or run tubing. On this location 185 stands were run in the hole in 45 minutes. Drive-In Ramblers equipped with the Dual Speed System are the answer to faster, more efficient, and more economical well servicing and workover operations. The Dual Speed System can be installed on most types of Ideco servicing and workover rigs.

FOR COMPLETION

... On a deep well in the scenic foothills of the Canadian Rockies. This Ideco DIR-604 Drive-in Rambler Rig is the largest self-propelled rig ever put on location in Canada. Nearly 400 horsepower propels this highly mobile rig to the job. The same engine powers the H-40 Hydrair Hoist on the job. The 95-ft. Kwik-Lift Mast has a gross column capacity of 300,000 pounds and a hook load capacity of 210,000 pounds. It will rack 15,000′ of 2⅞″ drill tubing or 6,000′ of 4½″ drill pipe.

FOR DRILLING

... On locations in Northern Louisiana and Arkansas, this Ideco DIR-503 is regularly drilling 3,000 to 6,000 feet. Drive-In Ramblers are particularly suited to "slim-hole" drilling to even greater depths. These rigs can be equipped with engines ranging from 114 to nearly 400 horsepower. A wide range of Ideco Hydrair Hoists and Kwik-Lift Masts are available. Ask your Ideco representative for full details on these versatile, highly-mobile, self-propelled rigs.

IDECO DRIVE-INS—four ways faster

faster moves — faster rig-up — faster work — faster rig-down

WRITE FOR BULLETIN DRB-6A

IDECO®

P. O. Box 1331, Dallas, Texas

. . . map makers will lay it bare in biggest program in U. S. history

BY FRANK J. GARDNER

IF GOOD MAPS can help to find oil and gas, we can look for some lively campaigns in Kentucky in the years ahead. For that state is undergoing the largest detailed mapping program in United States history. September 1 marked the end of the first year of the $12-million project, and it has 9 years to go.

Geologic mapping of the entire state is being done by the Kentucky Geological Survey and U. S. Geological Survey on a 50-50 cost basis. When completed, the surveys will have published 750 individual maps, each one covering about 59 sq. miles at a scale of 1 in. to 2,000 ft.

A map-delinquent nation . . . Complete topographic mapping of Kentucky was finished in 1956; it required 780 quadrangle maps to cover the state's 40,395 sq. miles. When the geologic mapping is finished in 1970, it will be the only state completely covered by modern maps. This may be hard to believe, but only 13 of the 50 states have ever been completely mapped for topography; over-all, the nation has less than 40% coverage at standard scales.

V. E. McKelvey, acting chief geologist of the USGS, says that only about 15% of the nation is covered by geologic maps satisfactory for modern needs. The enormity of the task involved in complete U. S. coverage can only be imagined. But a look at what's involved in the Kentucky project will give some idea of what lies ahead.

About 18 months are required to do the field work, editing, illustration, and printing of each of the 750 maps. During the first year, field work was finished for more than 1,700 sq. miles. Fifty USGS men are putting full time on the program, and 20 more will be needed when it reaches full speed.

To accomplish a similar program nationwide, then, would involve an expenditure of about $1 billion, 66,000 individual maps, and 4,400 geologists! And that doesn't include topographic mapping which should precede the geologic maps. The Kentucky topographic work ran to $6 million, about half the estimated cost of the geologic work.

Could achieve a lot with maps . . . Big as it is, though, the job **should** be done nationwide. Armed with accurate topography and geology, this country could achieve new miracles in development of its natural resources, in engineering projects, conservation programs, and industrial development, not to mention the many new oil and gas provinces that might be discovered.

This is hardly a new idea. But it's one that has foundered in Washington for 77 years.

Ever since 1884, proposals for nationwide map programs have come before Congress at various times. The first one estimated the job would require 24 years and $18 million; in 1925, another pegged the cost at double the 1884 figure and the time at 20 years. But the money was never forthcoming from the federal till. After World War II, the need was more evident than ever before, and since that time, the USGS has greatly expanded its efforts. New methods and new instruments enabled it to map 133,000 sq. miles in 1955, compared to only 12,000 sq. miles in 1943. Today, it's doing even better.

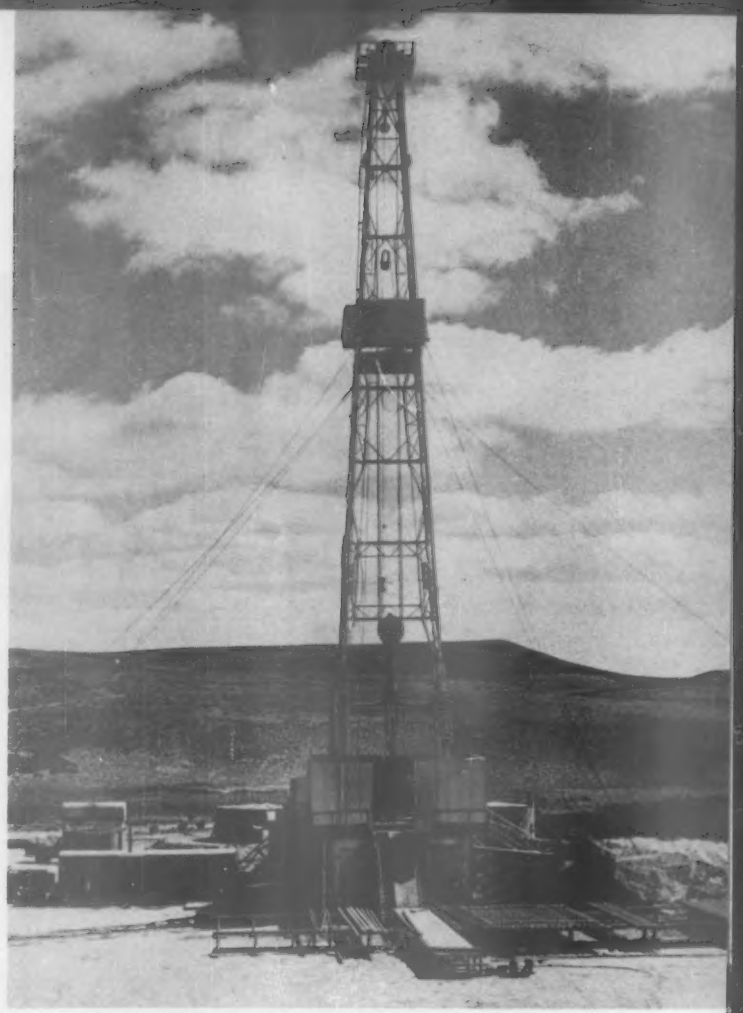
Kentuckians are setting a good example. Other states must follow, and when they do, the oil and gas business will benefit along with everybody else.

Here's how

South American exploration

varied in 1960

Enough oil was produced in Latin America last year to satisfy the continent's demand, but considerable oil was imported from other countries, increasing the quantity of South American crude seeking markets in North America and Europe.



LAST YEAR'S EXPLORATION WORK in Argentina netted eight new fields and confirmed potentialities of several previous discoveries. Fig. 1. (Photo courtesy Pan American Petroleum Corp.)

SOUTH AMERICAN exploration and development varied widely from nation to nation in 1961. Continental oil production averaged 3,474,100 bbl. per day, up 5% over 1959.

Venezuela. There were 437 wells drilled in Venezuela in 1960. The most active fields were Bolivar Coastal with 60 wells, Elotes with 11, Miga 17, Zapatos 12, La Ceibita 12, Morichal 31, Tia Juana 18, Lake Maracaibo 36, Mata 25, and Lama with 12.

Wildcat drilling decreased 50% last year. New pools were opened at Zulia Lake and Zulia Land, Anzoategui, Gulf of Paria, Monagas, Delta Amacuro, Barinas, and Guarico. A total of 56 wildcats were drilled, 16 of them successful.

Colombia. There were 50 wildcats drilled in this country last year, 16% fewer than in 1959. Of the wildcats drilled, 11 were successful. Exploratory, stratigraphic, and development drilling were all down in Colombia last year due to uncertainties of the future oil policy of the government, world supply, and other factors. The most important discovery was Ecopetrol 9 Llanito, northeast of Galan field. This well test-flowed 3,120 bbl. of oil per day. Production is from Mugrosa Oligocene at 7,790 ft. This is the northernmost Mugrosa production on the west side of the Middle Magdalena basin.

Sinclair Colombian Oil Co. dually completed 1 Santos 60 km. northeast of Barrancabermeja. This well flowed 989 bbl. of oil per day on ¼-in. chokes from two Eocene La Paz zones. Outpost wells were staked immediately. Total depth at the Santos was 9,964 ft.

Shell Condor completed 4 Cristalina 25 km. northeast of Cantagallo-Yarigui field. It flowed 1,260 bbl. per day on ¾-in. choke. This field should grow in 1961. It moves commercial La Paz Eocene production to its northernmost point in the Middle Magdalena basin.

Texas Petroleum Co. completed 1 Guavio as a small dual producer. This is the first oil of any commercial amount in the Llanos basin, 110 km. east of Bogota in the foothills of the eastern Cordillera. The discovery well flowed 554 bbl. of oil on ⅜-in. choke from Lower Tertiary at 9,507 ft. This field probably has considerable reserves, but its location makes its future development uncertain. The No. 2 well is under way 5½ km. southwest on the same structure. Several small discoveries were completed in the Middle Magdalena basin.

Brazil. There were 235 wells drilled in Brazil in 1960, up 6 over 1959. There were 95 wildcats drilled and 20 active tests at the end of the year. Footage drilled in wildcatting rose to 567,322 ft. There were six successful wildcats. . . five new fields and one new pay.

In the Amazonas-Maranhao basins, drilling extended from the Peru border east to the north coast of Maranhao State. The 1959 discovery at Autas Marim failed to be extended in 1960.

(Based on AAPG Bulletin, July 1961.)

The 1959 discovery at Rio Sao Francisco RSF-1-A1 has proven subcommercial. The Rio Sao Francisco embayment, however, is still a promising exploratory area in the Sergipe-Alagoas basin.

New strikes in the Reconcavo-Tucano basins were made at TA-1-Ba (Taua), an Ilhas and Candeias "A" zone discovery; Se-1-Ba (Sauipe), a Candeias "A" zone well; Jd-1-Ba (Jacaranda), an Ilhas and Candeias "A" well; Bj-1-Ba (Brejinho), a Candeias "A" well; MD-2-Ba (Madre de Deus), a Candeias producer; and, TQC-1-Ba (Taquipe Central), an Ilhas discovery. Step-out drilling was successful at: South Taquipe, a long Fourth Zone step-out producer at Candeias No. 135 and a confirmation test which flowed over 1,000 bbl. per day (Brazil's deepest producer), a new Sergi pool in Buracica (Ba-40), a new Ilhas gas pool confirmed at Agua Grande by AGb-11, a confirmation of a Cambuqui sand pool at Taquipe, and a number of field extension wells.

A wildcat drilled in the northern half of the Espirito Santo basin found some 650 ft. of clastic Tertiary sediments, condemning a large part of the basin. Some oil shows were found at Dost-1-MT Dourados wildcat on the western flank of the basin in Mato Grosso State in the Parana basin.

Peru. Development drilling increased sharply from 55 to 124 in 1960. All field-well drilling was in the coastal fields in the northwestern part of the country. There were 21 wildcats drilled in Peru last year. All were extensions to existing fields in northwestern Peru. About 10% of total drilling last year was offshore with the drilling barge "Rincon." There were 10 oil discoveries in Peru last year and 11 dry holes.

Chile. There were 11 wildcats drilled last year, opening 2 new oil fields, Daniel and Condor, and 1 new gas field called Posesion. The Daniel discovery is a healthy addition to Chile's oil reserves.

1960 DRILLING ACTIVITY IN LATIN AMERICA

	Field wells				Wildcats			
	Oil	Gas	Dry	Total	Oil	Gas	Dry	Total
Mexico								
Northeast	6	9	11	26	0	11	29	40
Tampico	276	0	34	310	16	0	41	57
Vera Cruz	0	0	0	0	0	0	4	4
Saline-Tabasco	210	5	35	250	41	8	24	73
Baja California	0	0	0	0	0	0	2	2
Others	....	...	...	....	57	19	100	176
Total	492	14	80	586	114	38	200	352
Venezuela—Dev.	185	0	27	212	25	0	31	56
Outposts	....	...	...	....	120	0	49	169
Total	185	0	27	212	145	0	80	225
Colombia	65	1	14	80	8	3	40	51
Brazil	118	1	21	140	6	0	89	95
Peru	111	0	13	124	10	0	11	21
Bolivia	20	0	3	23	1	0	17	18
Ecuador	63	0	1	64	2	0	9	11
Guatemala	0	0	0	0	0	0	5	5
Costa Rica	0	0	0	0	0	0	3	3
Puerto Rico	0	0	0	0	0	0	4	4
Argentina	525	22	57	604	114	22	112	248
Total	1,579	38	216	1,833	400	63	570	1,033
Grand Total	1,979	101	786	2,866	...	...	...	....

Bolivia. Only 1 oil discovery was reported here last year out of 18 wildcats drilled. Gulf Oil Corp. completed 1 Caranda north of Santa Cruz, about 300 km. from production at Camiri field. Initial production was 300 bbl. per day from lower Gondwana. This is the first discovery of oil north of Camiri.

Ecuador. Two important wildcats were drilled offshore by California Ecuador Petroleum Co. The 1 Golfo was abandoned at 4,107 ft. with good shows in the Azucar sandstone. The 1 Santa Clara stopped at 4,987 ft.

Argentina. YPF exploration. There were 69 wildcats drilled in Argentina last year (2 in Salta Province, 7 in Mendoza, 3 in La Pampe, 4 in Rio Negro, 11 in Neuquen, 38 in Santa Cruz, and 4 in Chubut). This exploration drilling netted eight new fields and confirmed potentialities of several previous finds.

In the Province of Chubut on the north flank of the Golfo San Jorge basin, well No. V-30 in the Pampa Manantiales was drilled to 6,730 ft. Operators completed it for 64 bbl. per day from an Upper Cretaceous sand at 3,380 ft. in the San Diego pay. The well also flowed 3

SOUTHERN ARGENTINA is growing into an important oil province. Pictured here is part of Pan American's 83-mile pipeline. Fig. 2.

bbl. per hour from beds in the bottom part of the Porfirica Series, an unproductive sand previously.

In Santa Cruz Province on the south flank of the Golfo San Jorge basin, well 0-159 on the El Puma anticline was drilled to 6,900 ft. Completion was for 240 bbl. of oil per day from 5,950 ft. Pay is the Chubutiano formation of Upper Cretaceous age. Well N-7 in the western part of the basin on the Perales anticline made 314 bbl. per day from 20 ft. of sand at 3,000 ft. in the Chubutiano.

In Neuquen Province, well NLM-1 found 14,000 M.c.f.d. from a 50-ft. sand at 2,950 ft. in the Neocomian Lower Cretaceous. The well is at Loma Montosa on a well-defined structure on the Neuquen-Rio Negro Province line. The NLP-1 well at Loma Potrillo in Neuquen Province flowed 270 bbl. of oil per day from sand at 3,100 ft. in the Titonian Upper Jurassic.

In Rio Negro Province, wells RCO-1 and RCO-2 were drilled at Catriel Oueste. The first well was a gas strike in 1959 and found oil in 1960. The second well is an oil producer with an initial of 1,000 bbl. per day from Neocomian sands and limestones. This confirms the important new field which has oil at 2,625-2,960 ft.

New gas fields were discovered in Rio Negro Province by well RPR-1 at Punta Rosada. Gas is between 4,260 and 4,600 ft. This is a large structure, commanding many more tests to prove its potential. In Salta Province, well SJ-2, 40 km. east of Campo Duran, had 157 bbl. of light crude oil per day and 15,000 M.c.f.d. from 16-33-ft. sands within glacial clay grits. Pay is between 8,840 ft. and 9,100 ft. This new area will see much more exploration and development as a result of the gas find.

The following companies had development contracts in Argentina: Pan American Petroleum Corp. in Chubut and Santa Cruz; Tennessee Argentina in Tierra del Fuego; Union Oil Co. in Chubut and Santa Cruz; Esso Argentina, Inc., in Neuquen; Shell Production Co. of Argentina in Rio Negro-Provincia Buenos Aires); L. R. Development, Ltd., in Mendoza and Santa Cruz.

Pan American continued its operations on the north flank in Chubut's Cerro Dragon, Canadon Grande, and anticlinal Grande fields and nearby areas. New oil was found at Canadon Pedro, Las Flores, El Triangulo, San Agustin, and La Madreselva. The company drilled 153 wells (137 producers and 16 dry).

Tennessee Argentina continued to work in the Gobernacion of Tierra del Fuego, completing 39 producers out of 46 tries. New oil was found at La Sara Norte, Rio Aviles, and Cabo Nombre. Union drilled six dry holes on the north flank in Chubut Province.

Esso kept up its exploration in the contract area in the center of the Nuequen basin and north of the Plaza Huincul. Esso found oil at Gu-1 in Guanco field. The well flowed 214 bbl. per day on ¼-in. choke. Shell drilled stratigraphic tests, four of which hit basement in Rio Negro and Buenos Aires provinces. L. R. Development, Ltd., completed 56 wells in Mendoza Province, 4 of them wildcats. The RV-3 well opened new Rio Viejas field. The company also hit oil at Punta Deseado and San Martin and gas at Del Rio south of Rio Deseado, Santa Cruz Province.

Goen lime produces at Concho County, Texas

Goen lime production was opened by Tucker Drilling Co. at 1 Cora Henderson in the extreme southwest part of Concho County, West Texas.

The well flowed 116 bbl. of oil daily through 14/64-in. choke from perforations at 4,055-58 ft. Location is in Section 43, Block 8, H&TC Survey, 10 miles southwest of Eden town site in the one-well West Eden Hope lime field area.

Confirmation. Sunray Mid-Continent Oil Co. completed 1-A Ella Houston as a confirmation discovery to newly opened Strawn production at 1 Ella Houston in the northwestern part of Concho County.

The confirmer flowed 112 bbl. of 42.6°-gravity oil per day through 12/64-in. choke. Perforations were in the Pennsylvanian Strawn lime at 3,460-66 ft. Location is in the Ridge Goodrum Survey 2, 2 miles east of the town of Paint Rock and ⅜ mile southwest of the field discovery well.

Tom Green County. Tucker Drilling Co. completed 3-A Mrs. Cynthis Malone in Kent-Strawn field, 17 miles southeast of San Angelo.

The well flowed 126 bbl. of 39.4°-gravity oil daily through 16/64-in. choke from perforations at 4,770-74 ft. in middle Strawn. Location is in Section 209, Block 11, SPRR Survey.

Andrews County. Pan American Petroleum Corp. completed 193 Midland Farms "AK" in Inez-Ellenburger field, Andrews County, flowing 497 bbl. of 46.9°-gravity oil per day on 20/64-in. choke from perforations at 11,791-11,826 ft. The well is a dual producer in both Fusselman Silurian and in the Ellenburger, regular field pay. From Ellenburger it flowed 588 bbl. per day through 12/64-in. choke from 12,423-33 ft. Location is in Section 33, Block 41, T-2-N, G&MMB&A Survey, 16 miles southwest of Andrews and 2,200 ft. north of 1 Midland Farms operating area, field discovery well of Inez-Ellenburger.

Coastal Texas wildcat makes good oil flow

A good oil well has been completed by United Producing Co., in a wildcat just east of East Columbia in Brazoria County, Texas Gulf Coast. It is 2½ miles northwest of Bailey's Prairie field, and about the same distance southeast of production on West Columbia salt dome.

United's well flowed 224.94 bbl. daily through 9/64-in. choke for potential rating. Flowing pressure was 1,190 psi., and gas-oil ratio 715 cu. ft. per barrel. Gravity of the oil is 37°.

Production is from Frio sand topped at 8,631 ft., and perforated at 8,636-40 ft. Total depth is 9,222 ft.

South Texas dry hole makes gas discovery

Dry-gas production has been opened in an old dry hole 3 miles southwest of Fulshear field in northern Fort Bend County, Texas Gulf Coast.

Hole was drilled in 1955 to 8,011 ft. Mason & Co., present operator, cleaned out and ran 4½-in. casing

to 4,160 ft. The gas is from a 4,000-ft. sand which showed up on the electric log.

Volume of gas flow has not been reported.

Location is less than 5 miles south of the giant Katy field on the north in southeastern Waller County.

Rodessa sand pays off in East Texas oil find

East Texas' Rodessa sand is paying off prolifically in a new discovery in Anderson County.

There Humble Oil & Refining Co. and Ohio Oil Co., joint operators, have completed their 1 M. C. Calhoun wildcat flowing 365 bbl. of 38.4°-gravity oil daily through ¼-in. choke.

It appears to be one of the best Rodessa discoveries in many months. Flowing pressure of the discovery well registered 1,000 psi. Flow was with a good ratio of 780 cu. ft. per bbl.

Rodessa pay is perforated at 10,046-68 ft. Hole was drilled to 11,880 ft.

The discovery is 86 miles northeast of Palestine, in the north-central part of the county. It is about midway between the Concord and Brushy Creek salt domes, placing it about 2½ to 3 miles west of production on the former. Brushy Creek dome has been unproductive so far.

With this discovery, increased interest is placed on another wildcat W. R. Hughey and W. C. Perryman are starting about 1¼ miles north. That test, 1 J. W. Elrod, is set up as a Travis Peak test to 11,200 ft., but will check closely the Rodessa section through which it goes.

Good flowing outpost well completed in Oklahoma

A 20-bbl. per hour outpost discovery well is reported in Kay County, northern Oklahoma. The well is Toto Gas Co. 1 Vincent in NW NW NW 34-27n-1e, 1 mile west of West Garrett pool.

The well flowed 20 bbl. per hour from Skinner sand perforations at 3,653-69 ft. after fracturing. Toto is starting another well at 2 Vincent in NW SW NW 34. Natural Gas Drilling, Inc., will skid rig from the 1 Vincent well for the 4,000-ft. try.

Garfield County. Another northern Oklahoma well is Texaco Inc. 1 Kokojan in C NW SE 11-20n-7w, north of booming Kingfisher County.

The well extends Northwest Bison field 1 mile north and is the third producer. It flowed 159 bbl. of load oil and 178 bbl. of new oil with no water in 24 hours through 16/64-in. choke from Meramec Mississippian open hole at 6,904-91 ft. The discovery well here was Texaco Inc. 1 Fuksa in C NW SE 14. It flowed 26 bbl. of oil and 280 M.c.f.d. from Manning Mississippi and perforations at 6,754-78 ft. The confirmation well, 1 Earnest Milacheck, C SE NW 23-20n-7w, was recently completed flowing 144 bbl. per day from Meramec open hole at 7,017-7,112 ft., swabbing.

Kentucky driller faces fishing chore

In Wolfe County, Kentucky, Kentucky Drilling & Operating Co. has a fishing job at 2,893 ft. on its deep wildcat 1 Golden Day. Test is 30 ft. from west line, 2,700 ft. from north line 18-P-71 in the northwestern part of the county. Formation tops released to date include: Mississippian Big Lime, 389 ft., Corniferous Lime, 1,214 ft., Clinton (Silurian), 1,248 ft., Brassfield, 1,440 ft., Richmond (Ordovician), 1,495 ft., Tyrone Lime, 2,387 ft. and Black River, 2,429 ft. Shows of oil and gas were had in the Corniferous section.

Arbuckle well completed in southern Oklahoma field

West Spring Creek Arbuckle production is reported at Sinclair Oil & Gas Co. 1 Womble in SE SW SE 2-4s-3w, Northwest Hewitt field, Carter County, southern Oklahoma.

The well flowed 178 bbl. of 39°-gravity oil in 7 hours through 18/64-in. choke from perforations at 3,820-50 ft. Sinclair also has a south offset and a well in 3-4s-3w going.

Northern Oklahoma. In Garfield County, Pure Oil Co. confirmed production in Meramec and Oswego zones at the offset to new Southwest Waukomis field.

The 1 Troska, C SE NW 33-21n-7w, south offset to Alex McCoy's 1 Troska in C SE SW 28-21n-7w, flowed 37 bbl. of load and 17 bbl. new oil in 24 hours and then average 2 bbl. of oil per hour on a 4-hour flow test. Zone is open hole at 6,900-7,000 ft. in Meramec. From Oswego at 6,270-80 ft., the well made 14 bbl. acid water and 16 bbl. condensate in 6 hours with 1,834 M.c.f.d.

The field discovery well flowed 85 bbl. per day from Meramec open hole at 6,894-7,000 ft. and 40 bbl. condensate and 1,790 M.c.f.d. from Oswego at 6,267-75 ft.

Important gas-condensate strike completed in western Oklahoma

Blaine County in western Oklahoma has another new field at Texaco Inc. 1 Swanegan, C SE NE 11-16n-11w, 4 miles northeast of Watonga. The well flowed 5,400 M.c.f.d. and 62 bbl. condensate through 12/64-in. choke from 9,030-44, 9,054-64 and 9,071-77 ft.

New gas field indicated in Arkoma basin, Oklahoma

Gas is reported on tests at Pan American Petroleum Corp.'s wildcat in the Cartersville area of Le-Flore County, southeastern Oklahoma. The 1 Jones, C NW SE 30-9n-24e, Arkoma basin, flowed 2 M.M.c.f.d. from pay at 5,202 ft. Nearest similar pay is 2 miles north.

Sinclair Oil & Gas Co. 1 Guthrie in NW NE SW 1-7n-19e, South Lewisville field, Haskell County, flowed 1,788 M.c.f.d. during tests of the Cromwell sand at 6,296-6,328 ft. Flow was on ¾-in. choke.

New gas-condensate pay opens in Houma area

Discovery of a new deep gas-condensate zone in Houma field of Terrebonne Parish, southern Louisiana is reported by Union Oil Co. of California. Union holds a block of 4,500 acres surrounding the discovery.

The well, R. R. Barrow, Inc., Unit 3-2, produced at the rate of 6 M.M.c.f. of gas with 100 bbl. of 43°-gravity condensate per day through ⅛-in. choke with 10,010 psi. tubing pressure.

The well is bottomed in the Bourg sands at 14,999 ft., with perforations at 14,937-47 ft.

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Large gas flow recorded in new South Texas well

A well with an open-flow potential of 139 M.M.c.f.d. of gas has been completed in the Patricia area, 2 miles west of Victoria, in Victoria County, South Texas.

The prolific gasser, Gulf Sands Oil Co.'s 1 Anton Hanselman, is productive from the field's 2,950-ft. sand, perforated at 2,922-26 ft. It is the largest gas well so far completed in the area.

Shut-in pressure at the top is 1,223 psi.

Second gas pay produces in new East Texas field

The second well for the new Caraway field, in Shelby County, East Texas, has been completed as a new-pay discovery with production from a slightly shallower zone in Paluxy from that of the field's discovery well.

Miles F. Caraway, who opened the field last April, drilled the second well as Caraway Drilling Co.'s 1 A. E. Johnson.

The initial well, 1 L. W. Caraway, was gas productive from Paluxy perforations at 3,124-32 ft. The new well is perforated at 3,064-68½ ft.

Calculated open-flow potential is 2,400 M.c.f.d. of gas. Pay is a sandy lime. Location is a half mile west of the field discovery. It is 12 miles southeast of Joaquin.

Garfield wildcat is dual discovery

In Oklahoma, Sunray Mid-Continent Oil Co. has opened new production at a dual discovery in Garfield County.

The 1 Hladik, SW NW 32-20n-6w, flowed 280 bbl. of oil a day through 19/64-in. choke from Meramec open hole at 6,875-7,072 ft. Perforations at 6,648-90 ft. opposite the Manning pumped 17 bbl. of oil a day. Total depth was 7,072 ft. with 5½-in. casing cemented at 6,875 ft. The discovery is located 1 mile north of East Hennessey pool.

In Pontotoc County, Sunray has completed the 20 Richey, NW SW SE 1-4n-7e, as a dual oiler.

Final tests gaged 100 bbl. of oil a day on the pump from Senora sand perforations at 986-1,010 ft. Deeper in the hole Gilcrease perforations at 1,967-2,000 ft. pumped 33 bbl. of oil a day. The hole was drilled to 2,150 ft.

Sunray finaled the 2 Herrin, C SW SW 6-19n-5w, Kingfisher County as a dual oiler in East Hennessey pool.

The well flowed 189 bbl. of oil a day through ½-in.-choke from perforations at 5,794 ft. in the Cleveland. Meramec open hole at 6,484-6,586 ft. pumped 22 bbl. of oil a day. Total depth was 6,586 ft. with 7-in. casing cemented at 6,484 ft.

Erie-Crawford is Pennsy hot spot

OF THE FIVE deep wells completed recently in Pennsylvania, one is located outside of the Erie-Crawford County area. All the others are in this current hot spot.

Snee, Eberly et al. 1 Farkas extended Williams pool to the southwest. This well was drilled in Somerset County on the Laurel Hill anticline. The Oriskany sandstone was found at 8,053 ft. After fracture, the Oriskany got 7,450 M.c.f.d. with rock pressure of 3,029 psi. It looks as if the southwestern trend of the Laurel Hill anticline will be productive along its entire length. This is a highly faulted area but seismic works seem to give the correct answer.

Northwestern Pennsylvania. Two gas field wells were drilled in northwestern Pennsylvania's corner along with two dry holes.

Nick Sevich 1 Worden in Spring Township, Crawford County, found gas at 3,506 and 3,510 ft. in the Medina. After fracture, the well made 3,500 M.c.f.d. with a rock pressure of 1,175 psi. This well was drilled in Indian Springs pool.

R. C. Ernest 1 O. E. Park in Conneaut Township, Erie County, Tracy pool well, was completed flowing 1,750 M.c.f.d. after fracture from the Medina sand. Rock pressure was 1,025 psi. Total depth was 3,384 ft.

Atlas Drilling Co. 1 J. E. Hinkle in Cambridge Township, Crawford County, was dry in the Medina. It was plugged and abandoned after reaching the Queenston Upper Or-

dovician. Another wildcat was also dry. This was the Lake Shore Pipeline Co. 1 R. A. Lampman in Conneaut Township, Crawford County. After reaching the Queenston the well was abandoned.

At the first of September there were 12 wells drilling in the Erie-Crawford County area. Operators should complete a number of wells in this area by the end of the year. A Medina test is to be drilled in extreme northeastern Pennsylvania. This location has stirred considerable interest in the state.

Ohio field discovery gets two offsets

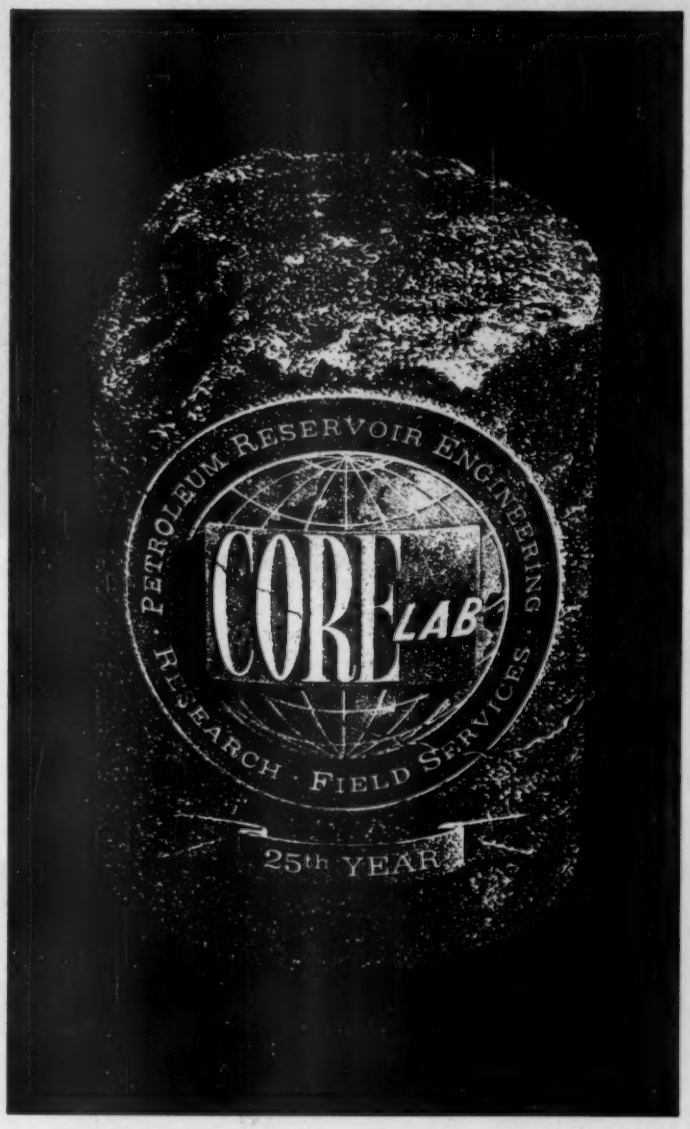
In Ohio, United Producing Co. has announced two offsets to its new field discovery in Canaan Township, Morrow County, as successes.

The 2 O. & E. Myers, Section 33 finaled with an initial of 50 barrels oil per day and the 1 Bush-Levering, Section 28, is flowing 200 barrels oil per day through ¼-in. choke. The Trempealeau tops were 3,014 ft. and 2,947 ft. respectively. The pay in the Myers well was treated through perforations from 3,016-30 ft. with 6,000 gal. of acid. Bush-Levering was treated from 2,952-96 ft. with 1,000 gal. of acid and fractured with 9,000 gal. of 8% treated acid and 5,800 lb. sand.

Three rotaries and two cable tool rigs are presently digging for this pay in the area with United Producing drilling 5 and 6 and Sam Casady Jr. and Elliott Thompson each on an initial venture. Atlas Exploration Corp. has moved about 1¾ mile south to Cardington Township, Morrow County, and is at 2,145 ft. on 1 J. W. & R. F. Wolfinger, Section 3.

Deep Kentucky test being drilled

Only one deep exploratory test is currently drilling (at 1,300 ft.) in eastern Kentucky. This test is that of United Fuel Gas Co. at its 1 Wilson Rawlings in Mason County, which borders the Ohio River. Well is located in the Orangeburg Quadrangle 15-Y-71, 75 ft. from the west line and 950 ft. from the north line. Proposed depth is indicated at 3,450 ft. at which depth granite is expected.



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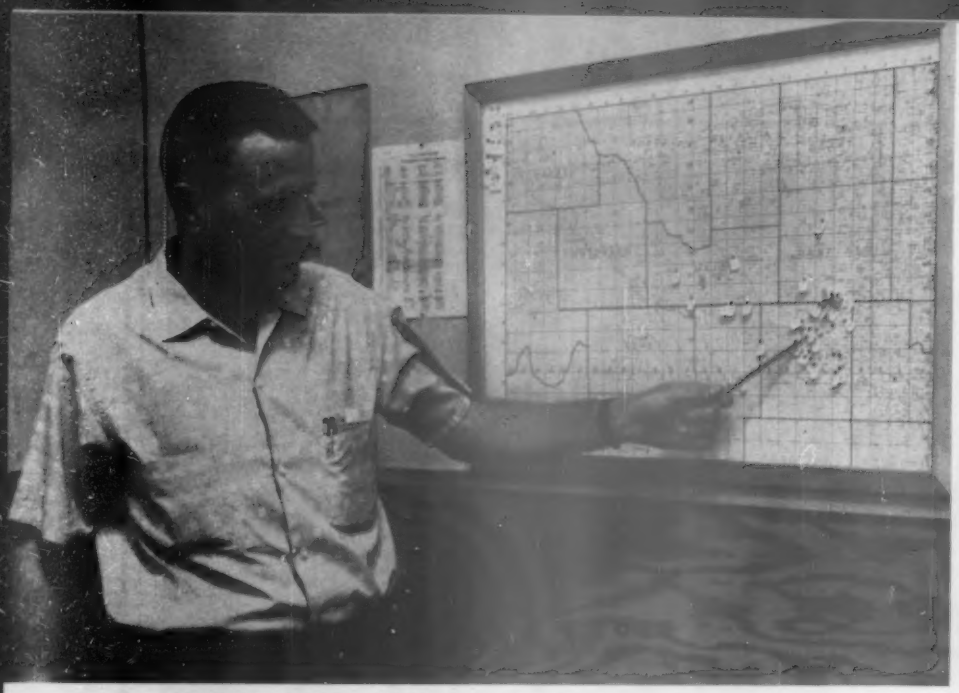


YOU CAN HARDLY DRILL A DRY HOLE in Oklahoma's busy Kingfisher County . . . a map once blank is now becoming green with discovery pins.

Boom town '61 —oil action in

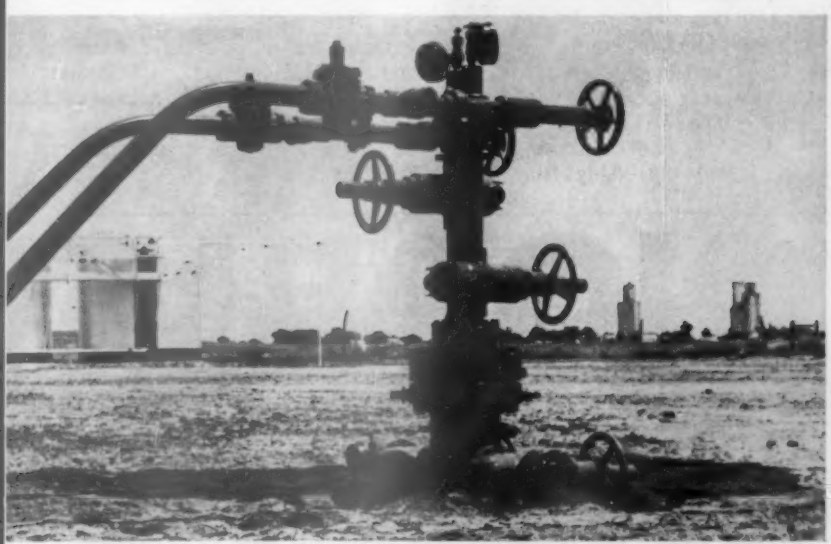
STAFF PHOTO
BY
CARL HOOT

SUPPLY HOUSES AND PIPE RACKS take their place beside Kingfisher County's other prize crop—wheat.

ONCE A LEISURELY-TRAVELED ROAD, State Highway 51 is now bustling with trucks hurrying back to supply piles for more pipe as the Hennessey area oil field spreads through section after section.

Sooner city sets fast pace

The nation's busiest oil country gets busier . . . 16 out of 26 wildcats successful (61.5%), 230 out of 234 field wells produce (98.3%) . . . Last year's total was 21 new fields out of 26 wildcat tries, 96 successes out of 100 field-well completions. Grand total in less than 2 years is 363 producers out of 386 tries. Current active wells . . . 125.



ABOUT ONE-THIRD of the wells completed are dual producers. A few are triples. Drilling is on 80-acre spacing. Chief pays are Manning at 6,300-6,800 ft., Meramec at 6,400-7,000 ft., and Cleveland from 5,600-5,800 ft.

ONE COMPANY drilled its first 17 wells successfully for a daily potential of 6,233 bbl. Some companies have drilled a score or more wells and have yet to hit a duster.

Movie-lot drilling turns up another find

THE DRILLING play from the 20th Century movie lot in Beverly Hills field in west Los Angeles has produced another fault - block discovery.

The new strike, made by Universal Consolidated Oil Co., is rated good for several hundred barrels a day. The operator has tested the well at 532 bbl. of 36°-gravity crude and 1,485 M.c.f.d. of gas. The flow was through a 20/64-in. choke with a cut of 2%, mostly emulsion.

The well, the 12C Community, probably is capable of making well over the 532-bbl. rate. This flow was taken with a tubing pressure of 2,070 psi. and a casing pressure of 2,975 psi.

The producing horizon is in the Miocene, but the perforated interval was not revealed. A Universal Consolidated spokesman did say the well has "several hundred feet of perforations." Total whipstocked depth was 11,382 ft., but the well was plugged back to 10,754 ft. for completion.

The drill site is on the movie lot, but the well was whipstocked to the west and bottomed under the company's Community lease. This is the first completion under this lease, which is the most northwesterly lease of the six held by the operator. The leases total 905 acres, with the biggest being the 280-acre movie-lot lease.

The 12C is the thirty-eighth well completed in the field by Universal Consolidated. The company is producing 32 wells at a combined daily rate of about 3,600 bbl. Two rigs are working in the field. The 12C was completed from a drill site in Sec. 26-1s-15w.

Second find. The new fault-block discovery in Beverly Hills is the second good strike Universal Consolidated has made this year. In fact, the two rate as the best made thus far in 1961 in California.

The company's other 1961 discovery was a new-pool find made in East Gosford field in Kern County. The pool's discovery well flowed 720 bbl. daily from two zones in the Stevens sands between 9,770-10,202 ft.

In the 5½ months since the pool was discovered, Universal Consolidated and its partner, Kern County Land Co., have completed seven wells in the pool. The wells are making a cumulative total of 2,000 bbl. daily.

Another well, the 65-26 KCY, is expected to be completed this month. Electric logs show the well has 48 ft. of pay sand in the upper Stevens and 106 ft. in the lower Stevens. The 65-26 is located in 26-30s-26e in Kern County. Total depth is 10,262 ft.

Small gas discovery made in California

A wildcat in California's Sutter County has been completed as a small gas discovery after failing to produce from the Upper Cretaceous F zone at 7,500 ft.

Occidental Petroleum Corp. has completed the 1 Sacramento Outing Club Unit B in the Ione sand at 820-27 ft. The well had a small flow, 752 M.c.f.d., and a shut-in pressure of only 340 psi. The well is in 11-16n-1w.

However, this is the only Ione production this far north in California. The Ione is the same as a prolific Domengine sand found to the south in the delta area around San Francisco.

Occidental is operator for itself and Standard Oil Co. of California on the 6,000-acre block. Additional drilling is planned, but the wells will be shooting for the F zone rather than the Ione.

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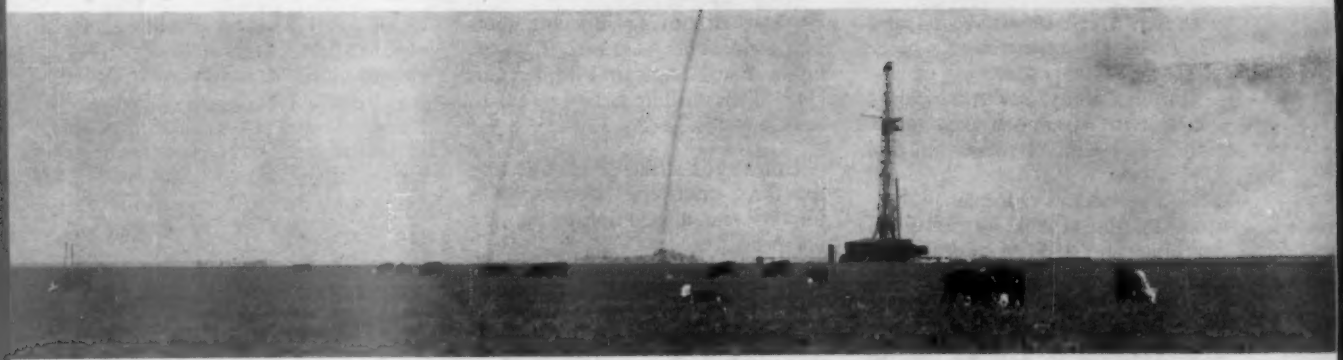


THE WILDCAT CAMPAIGN that has surged back and forth across three states in the Hugoton embayment in recent years now centers in Southwest Kansas.

HERE IS the Pan American Petroleum Corp. 1 Osborne, a deep Hugoton field area discovery completed in 1959—this sparked Pan Am's current development spree.

Drillers busy in Kansas' deep Hugoton

SOUTHWESTERN KANSAS is currently in one of its busiest exploratory and development campaigns in several years. Focal point is the Haskell, Morton, Stanton, and Stevens county area.

Pan American Petroleum Corp. is completing at 1 Black Gas Unit "C" in C SW NE 17-30s-33w, 1½ miles east of Satanta, Haskell County. Flow from Morrow Pennsylvanian sand at 5,270-5,318 ft. was 5,972 M.c.f.d. Flow was on ¾-in. choke.

This wildcat also has two Lansing oil zones indicated earlier on drillstem test at 4,134-89 ft. Flow was 4,260 M.c.f.d. and recovery was 120 ft. of oil. A test at 4,403-50 ft.

(Photos courtesy Pan American Petroleum Corp.).

PAN AM'S DEVELOPMENT in Hugoton Deep field has spread south to the dry bed of the Cimarron River. Here a well site is being staked in the middle of the river which is dry most of the year. New discoveries in this section of Kansas have come so thick and fast in recent months that the Nomenclature Committee has had a rough time keeping up.

recovered 4,100 ft. of free oil and 200 ft. heavily oil-cut mud.

Morton County. Pan American is testing two Morrow pays at 1 Slinker Gas Unit "B" in C NE SW 21-21s-40w.

Upper Morrow zone at 4,998-5,002 ft. got 41 bbl. formation oil per hour and 1 M.M.c.f.d. Lower Morrow at 5,295-97 ft. got 14 bbl. oil and 3 M.M.c.f.d. on ½-in. choke. Testing continues at this well. Location is 2 miles east of Kinsler gas field and 11½ miles northeast of the town of Richfield.

Stevens County. Pan American 1 Hahn Gas Unit "C," C SE NW 6-31s-38e, 6 miles west of Perril field and 14 miles northwest of the town of Hugoton, flowed 1,250 M.c.f.d. from perforations in the Morrow at 5,655-57 ft.

Other wells. Other activity in this section of the Hugoton field area of southwestern Kansas includes Pan American's 1 Harkreader Gas Unit "B" in C NE NE 21-30s-39w. Drilling is below 4,325 ft. at this well. The 1 Shore Gas Unit "D" in C NW 23-30s-39w is shut in after flowing gas from Morrow sand below 5,583 ft.

In Stevens County, Socony Mobil Oil Co. 1-A Strong in C SW NE 12-31s-35w is still at work after flowing 150 bbl. of oil on a 6-hour test. Mobil is still testing at 1 Anderson Trust Unit 1 in C SW NE 27-31s-35w. Cities Service Petroleum Co. 1 Skinner "C" in C SW NE 16-34s-35w is testing after flowing up to 1,800 M.c.f.d. on one test and 2,150 M.c.f.d. on another in the Morrow sand.

In Morton County, Cities Service 2 Crayton "A," C NE SW 18-32s-39w, is testing after flowing 10,500 M.c.f.d. from Morrow sand. Pan American 1 Renshaw Gas Unit "B," C NW 21-32s-39w, is drilling below 6,150 ft. Panhandle Eastern Pipe Line Co. is waiting on potential at a well in E½ W½ SE 32-34s-43w. The 1-32 Linscott "B" flowed 2 M.M.c.f.d. in 18 hours from Topeka.

In Haskell County, Pan American 1 Reimer Gas Unit in C SE SE 34-28s-34w is also waiting on potential test as a Pennsylvanian oil well. Graham-Michaelis Drilling Co. 1-15 Brennan in C NW SE 15-29s-33w is moving in cable tools with total depth at 5,802 ft. in St. Louis. Pan American 1 Miller Gas Unit "I" is drilling below 4,690 ft. in C NW SE 33-29s-33w.

Other 1961 strikes. Pan American has three discoveries on the books for this year in addition to the new prospects.

The 1 Nicholas Gas Unit "C" in C NE SW 15-30s-39w, 6 miles east of Shore field and 10 miles southeast of Johnson, Kansas, flowed 9,230 M.c.f.d. from Morrow sand at 5,556-74 ft. SIP was 1,225 psi. The 1 G. V. Welch Gas Unit "D" in C SE NW 17-29s-39w flowed 5,222 M.c.f.d. from Morrow at 5,520-22 and 5,476-78 ft. Total depth was 6,130 ft. The 1 Appleton Gas Unit in C NE SW 26-29s-39w flowed 1,205 M.c.f.d. from Council Grove at 2,710-2,809 ft. to open a shallower Permian field.

Two gas discoveries stir Arkansas side of Arkoma basin

NORTHWEST ARKANSAS' side of Arkoma basin has two more Atoka gas discoveries. Both are in the general area of the Cecil gas field in Franklin County. One, by Humble Oil & Refining Co., is a dual-zone discovery 1½ miles northeast of Cecil field. The other, by Gulf Oil Corp., is 2½ miles south of Cecil production. The latter is ¾ mile southwest of the much older and shallower Vesta field.

Humble's well, 1 Roy Currier, has an open-flow potential rating of 8 M.M.c.f. of gas from the Hale zone, perforated at 4,450-62 ft., and 19 M.M.c.f.d. from the shallower Ralph Barton and Dunn "A" zones at 3,582-94 ft. and 3,492-3,504 ft. Flowing pressure from the Hale zone 1,425 psi. through 20/64-in. choke with a flow of 1,700 M.c.f.d.

Gulf's well, 1 T. C. Drake, made 1,300 M.c.f.d. through ¾-in. choke with pressure of 40 psi. on the tubing and 480 psi. on the casing. Its pay is the Morris zone, perforated at 3,111-21 ft. Gas carried a spray of water.

Another Franklin County wildcat also has given indications of gas production. It is Republic Natural Gas Co.'s 1 McGee, 2 miles south of Cecil field, but more than 4 miles east of Gulf's discovery well. Drilling from 2,799 ft. to 2,937 ft., the well flowed at estimated rates up to 1 M.M.c.f.d. of gas, but declined to less than 260 M.c.f.d. Hole is being deepened with an original objective of 7,000 ft., or the top of the Pitkin formation.

Discovery wells

WESTERN CANADA

Alberta:
- Altair-Katex 7-2 Coronation, LSD 7, 2-36-11w4. Viking gas discovery. TD 3,615 ft.
- Imperial et al. 10-26 Lombell, LSD 10, 26-59-9w5. Mississippian gas discovery. TD 8,600 ft.

Alberta:
- Tennessee 10-27 Al Chestermere, LSD 10, 27-22-28w4. Basal Quartz oil discovery. TD 6,888 ft.
- H. B. 6-14 Sundre, LSD 6, 14-34-5w5. Elkton oil discovery. TD 8,920 ft.
- Supertest 2-19 Caroline, LSD 2, 19-36-5w5. Cardium oil discovery. TD 10,935 ft.
- McAlester-Arrowex 6-23 Westlock, LSD 6, 23-60-27w4. Viking gas discovery. TD 2,530 ft.

Manitoba:
- Barron Kidd 16-8 Poirer H.B., LSD 16, 8-6-30w1. Mission Canyon oil discovery. TD 3,354 ft.

CALIFORNIA

Sutter County:
- Occidental Petroleum Corp.-Standard Oil Co. of California 1 Sacramento Outing Club Unit B, E½ NW NW 11-16n-1w. Flowed 752 M.c.f.d. from Ione sand at 820-27 ft. TD 7,500 ft. New field discovery.

Los Angeles:
- Universal Consolidated Oil Co. 12C Community NE NE NE 26-1s-15w (surface location). Completed flowing 532 bbl. of 36°-gravity crude from several hundred feet of perforations in the Miocene. TD (whipstocked) 11,264 ft., plugged back to 10,754 ft. for completion. Fault-block discovery in Beverly Hills field.

COLORADO

Washington County:
- Kimbark Exploration Co. 2 Kalous, OWDD, OTD 5,318 ft. "J" sand 5,189-90 ft. TD 5,335 ft. "J" sand discovery, new field.
- Union Texas Natural Gas Co. 1 Jones, C NW SE 26-3n-51w. IPP 166 BOPD, cut 12% water, "J" sand 3,938-44 ft. TD 4,042 ft. "J" sand discovery, new field.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Land Office, Cheyenne, Wyoming. Notice is hereby given that 26 parcels of land totaling 4,727.68 acres within the known geologic structures of a number of fields in Carbon, Converse, Natrona, Park and Sweetwater Counties, Wyoming, are offered for competitive oil and gas leasing through sealed bids to the qualified bidder of the highest cash amount per acre at 2:00 P.M., MST, October 25, 1961, when bids will be opened. Details of the offering, and how and where to submit bids, may be obtained from the Land Office, Cheyenne, Wyoming. Arvin H. Olswold, Chief, Minerals Section.

▶▶▶ Personals

Michael L. Haider has been elected executive vice president and a member of the executive committee of Standard Oil Co. (N. J.). Haider, who was a vice president and director of the company, will continue on the Jersey board with responsibility as a contact director for Jersey affiliates and activities in Latin America.

H. W. Hightower, manager of lands in Union Oil Co.'s central division, Midland, Tex., has been transferred to Houston as manager of lands in the Gulf division.

E. A. Nollkamper, construction inspector for Shell Oil Co.'s Sealy, Tex., gasoline plant, now under construction, has been named Sealy plant foreman. Nollkamper has been with Shell 15 years.

Joe A. Huitt, manager of purchasing for Buffalo Petroleum Corp., has opened offices in Tulsa as an independent operator. Huitt had been with Buffalo for 6 years. He was with the old Deep Rock Oil Corp. for 26 years before joining Buffalo. He served Deep Rock in many production posts and was assistant to the vice president in charge of production before leaving the company.

A. D. Lodge, manager of Ohio Oil Co.'s commercial and special products-sales department, has been appointed representative for the international department, supply and transportation. Lodge will assist **F. C. Aldrich,** senior representative, in development of international markets for crude oil and liquids. He will headquarter in London after the first of the year. **W. T. Maddock,** senior refining engineer for Ohio, has been named assistant to **B. B. Miller,** who recently became refinery representative in Europe. Maddock will assist Miller in responsibilities for Ohio's refining interests in Spain and other European countries. He will headquarter in Europe after the first of the year.

Ray Harrison, exploration manager for Cardinal Petroleum Co., has been transferred to Billings, Mont., from Bismarck, N. D.

Harold Mosher, geologist with Sunray Mid-Continent Oil Co., has been transferred from Casper, Wyo., to Denver.

B. A. Tuller, Casper, Wyo., division consulting geophysicist for Pan American Petroleum Corp., has been named district geophysicist for the Casper district office. He succeeds **George L. Ellis,** who has been transferred to Midland, Tex.

William M. Baehr, geophysicist for Humble in Miles City, Mont., has been transferred to Billings, Mont. The Miles City office has been closed.

John R. Donnell has been named vice president of Ohio Oil Co.'s new world-wide activities organization. The group, based at company headquarters in Findlay, Ohio, will coordinate exploration, production,

DONNELL

RICE

transportation, refining, and marketing operations in 10 countries outside the United States. **Jack H. Rice,** president of Ohio's Marathon Pipe Line Co., has been named to succeed Donnell as vice president of supply and transportation for Ohio.

Blaine J. Yarrington, Chicago, has been named New York regional manager for American Oil Co. He succeeds **R. W. Reilly,** who has retired after 32 years with the company. **Robert G. Burns,** operations manager in St. Louis for American, will succeed Yarrington as deputy coordinator, administrative, in the marketing, supply and distribution department of Standard Oil Co. (Ind.), the parent company.

A. K. May has been appointed general manager of Houston Chemical Corp.'s ethylene oxide chemicals division. Ethylene glycol anti-freeze, sold in bulk to private-brand marketers, is the division's primary product. May was formerly manager of the surfactants and heavy chemicals departments of General Aniline & Film Corp. He also was with Jefferson Chemical Co., American Cyanamid Co., and DuPont at one time.

Robert L. Connell, district land man for Sun Oil Co. in Bismarck, N. D., has been promoted to administrative assistant in Denver.

Fred H. Warren, senior planning associate for Ohio Oil Co. in Findlay, Ohio, has been named manager of the company's forward-planning division.

Robert N. Custer, head of the planning and standards group in Sun Oil Co.'s engineering division, has been appointed administrative assistant to the director of engineering.

George Ray Sorrenti, vice president of Gas Machinery Co. (Canada), Ltd., has been named general manager of Montreal Engineering-Mannix, new Canadian company offering engineering and construction services to the petroleum, gas, and chemical industries. Company headquarters will be in Calgary. Montreal Engineering-Mannix is jointly owned by Montreal Engineering Co., Ltd., and Mannix Co., Ltd.

Stuart K. Clark, consultant in Continental Oil Co.'s international exploration and production department, has retired after 38 years with the company. He will become a geological consultant in Houston. Clark was assistant to the vice president and general manager, international exploration and production department, before becoming consultant in the department. He served Conoco as manager of the foreign department, manager of the royalty department, coordinator of exploration activities, and chairman of the exploration committee.

▶▶▶ Personals

Edward N. Heger has been named manager of chemical manufacturing for Ansul Chemical Co. in Marinette, Wis. He will also continue to head the chemical-products

HEGER

ABENDSCHEIN

division's process-development work. **Charles F. Abendschein,** manager of operations in Ansul's chemical-products division, has been named plant manager for Ancon Chemical Corp. in Lake Charles, La. Ancon is jointly owned by Ansul and Continental Oil Co. Construction will begin next month on the Lake Charles plant, which will produce 60 million pounds of methyl chloride annually. Abendschein will be in charge of all plant operations.

Staff appointments have been announced for Mobil International Oil Co.'s four new regional groups. Each region will have senior staff men to provide regional vice presidents with information on producing, manufacturing, marketing, legal matters, plans and programs, finance, and government, employe, and public relations. The four regions were set up in June and regional vice presidents appointed (OGJ, June 19, 1961, p. 181). Staff members for the inner Europe region will be: **Edward C. Cram,** producing; **Charles P. Baker,** manufacturing; **Karl F. Madsen,** marketing; **F. A. Allan,** counsel; **George A. Currie,** plans and programs; and **George H. G. Coulton,** relations. Northern and southeastern Europe region staff will include: **Richard E. Lauterbach,** manufacturing; **Burton C. Fowler,** marketing; **S. J. Kennedy,** counsel; **Francis C. Savage,** plans and programs; and **W. Jack Butler,** relations. Mediterranean and West Africa region staff members will be **Victor H. King,** producing; **Richard R. Plant,** marketing; **Rene P. Lavenant, Jr.,** counsel; **Charles N. Maravell,** plans and programs; **John S. Calvert, Jr.,** relations. Staff members for Latin America and the Caribbean region are **Kenneth W. Wiseman,** producing; **Donald A. Hermanson,** manufacturing; **David K. Roberts,** marketing; **Robert H. Asher,** counsel; **Charles J. Lause, Jr.,** plans, programs, and finance; **Edward L. Waggoner,** relations. Regional executives are **Jorge Mejia,** Latin America and Caribbean; **J. Byron Eckert,** northern and southeastern Europe; **Howard Bird, Jr.,** inner Europe; and **Alfred R. Tibor,** Mediterranean and West Africa.

Hector D. Walker has retired as a director of Constructors John Brown, Ltd., London. He will continue as a consultant to the company and as a director of Automatic Control Engineering, Ltd., and Corrosion & Welding Engineering, Ltd., subsidiaries of Constructors John Brown.

A. L. Solliday, president of Pan American Petroleum Corp., Tulsa, and **Charles W. Alcorn,** vice chairman of Falcon Seaboard Drilling Co., have been named 1961 winners of the Texas Mid-Continent Oil and Gas Association's Distinguished Service Award. Presentations will

SOLLIDAY

ALCORN

be made during the association's annual meeting in Fort Worth September 25-27. A top honor since 1936, the award goes annually to an independent producer and a major-company executive in recognition of outstanding industry service. Solliday, with Pan Am and its predecessors since 1923, has been president since 1958. He is active in industry service and technical organizations. Alcorn is a former president of Texas Mid-Continent. He has also worked steadily with API's Oil Information Committee and the Division of Production. He has been in the oil industry 43 years, rising from roughneck to top executive.

James K. Warne, manager of engineering at Gulf Oil Corp.'s Philadelphia refinery, has been named general manager of the refinery. He succeeds **Thomas A. Dietz,** who has been transferred to the Pittsburgh general office on temporary assignment. **Karl K. White,** director of design and construction at the Philadelphia plant, will succeed Warne as manager of engineering. **Jack W. Burk,** superintendent of the cracking department, has been named manager of operations for the refinery.

WARNE

B. S. Elliott, drilling foreman for Sunray Mid-Continent Oil Co. in Odessa, Tex., has been transferred to Abilene, Tex., in the same capacity.

Wayne E. Swearingen, Tulsa consulting engineer, has joined Livingston Oil Co., Tulsa, as executive vice president. He will be in charge of the company's expanded exploration, water flooding and property acquisition and will be assistant to the president. Swearingen was vice president and chief engineer for Alex W. McCoy Associates and president of International Geological Engineering Co., a McCoy subsidiary, before setting up his own engineering firm.

L. L. Henning, president and general manager of Irving Refining, Ltd., St. John, New Brunswick, affiliate of Standard Oil Co. of California, has been named general manager of California Standard's Pascagoula, Miss., refinery project. The company plans to build a 100,000-bbl. per day refinery at Pascagoula to serve requirements of Standard Oil Co. of Kentucky. **A. S. Guerard,** chief engineer at California Standard's Richmond, Calif., refinery, has been named assistant general manager of the Pascagoula project. **B. I. Roach,** assistant superintendent of the Richmond refinery, will be planning assistant for the project. Stockholders of both companies recently approved merger of California Standard and Standard of Kentucky.

▶▶▶ Personals

F. W. Sommer, area engineer for Texaco, has been transferred to Columbia, Miss., from Olney, Tex.

Robert W. Kelly has been promoted to senior civil engineer in the long-range planning section of Humble's technical division in Baytown, Tex.

S. B. (Sy) Moro, assistant manager of manufacturing-engineering for Shell Oil Co. in New York, has been appointed project manager for the company's refinery in Trafalgar Township, Ontario. Moro will supervise the engineering and construction program.

D. C. Lamm, assistant Midland, Tex., area manager for Humble Pipe Line Co., has been promoted to area manager. He succeeds **J. F. McCarthy,** who has retired. Lamm has been with Humble Pipe Line since 1927. He was Longview, Tex., district superintendent and West Texas division assistant superintendent before becoming assistant area manager in Midland.

Elvin V. Fox, district foreman for Panhandle Eastern Pipe Line Co. in Elkhart, Kans., has been named pipeline operations foreman for Anadarko Production Co.'s new Kansas Industrial Pipe Line.

Melvin H. Rattray, Jr., assistant manager of rates for Texas Gas Transmission Corp., has been promoted to manager of rates.

Wallace A. Robinson, engineer with Sun Pipeline Co. in Beaumont, Tex., has joined Mid-Valley Pipeline Co. as chief engineer. He will be responsible for engineering aspects of the company's automatic-control operation. In recent months Robinson has been on loan to Mid-Valley helping coordinate design for conversion of the line to automatic remote operation. He had been with Sun for 12 years, but had served an earlier loan assignment with Mid-Valley assisting in original design and construction of the company's facilities.

Dr. Norman D. Coggeshall has been named director of Gulf Research & Development Co.'s new physical sciences division at the Harmarville, Pa., research center. Coggeshall has been with Gulf in Harmarville since 1943. He had been director of the composition and structure division since 1955.

David R. Pefley, Humble, has joined Colorado Oil & Gas Co. in Denver as geologist. He replaces **Dick Sanders,** who recently resigned to open consulting offices in Denver.

William F. Brown, manager of petrochemical planning for Continental Oil Co. in Houston, has been named to Conoco's international department staff in New York. **Wyatt L. Walker,** assistant superintendent of the Ponca City, Okla., refinery, will succeed Brown in Houston. **Norman Newton,** Wichita Falls, Tex., refinery superintendent, will succeed Walker in Ponca City.

J. T. Bradley, refinery and chemical sales manager for Warren Petroleum Corp., has been promoted to general manager of the refinery and chemical sales department. **John W. Lesch,** sales manager in supplies and distribution, has been named general manager of this department. **A. E. Moore,** president of Warren's Dri-Gas Co. division in Chicago, has moved to Tulsa as general manager of domestic and industrial sales. In other changes in the liquefied petroleum gas division, **Louis W. Bullock,** who has been on special assignment, has been named southeastern regional manager with jurisdiction over the Jackson, Miss., Tampa, Fla., and Columbia, S. C., district sales offices. **F. J. LaFortune,** regional manager, has been named northeastern regional manager. He will be responsible for the Louisville, Ky., and New York district offices. **R. F. Maycen,** vice president of Dri-Gas Co., will succeed Moore as president. **F. T. Lundin,** vice president in charge of sales for Dri-Gas, has been named general vice president and assistant to Maycen in over-all management of the company.

Ralph H. Espach, Jr., geologist with California Oil Co., has been transferred to Billings, Mont., from Casper, Wyo.

Bernard J. Williams has been named project manager of SunOlin Chemical Co.'s engineering staff. He succeeds **Thomas G. Reynolds** who has resigned to join Thatcher & Patient, Inc., St. Louis consulting engineers. Williams was project engineer with Brown & Root before joining SunOlin last year. In the new post he will be in charge of engineering for all auxiliary plants connected with SunOlin's ethylene and ethylene oxide plants now under construction in Claymont, Del.

C. S. Windebank, managing director of Esso Research, Ltd., Abingdon, England, has been transferred to New York as vice

WINDEBANK

HAKALA

chairman of new uses activities for Standard Oil Co. (N. J.). **Dr. Neil V. Hakala,** deputy to the vice president of Esso Research & Engineering Co. for petroleum products, medical, basic, and analytical research, will succeed Windebank with Esso Research.

Sam B. Dunlap, Dallas sales manager for Core Laboratories, Inc., has been named Gulf Coast division manager. He will headquarter in Houston. **R. S. Bynum,** West Texas-Southeast New Mexico district manager, has been named Mid-Continent division manager. He will continue to headquarter in Midland. **James D. Harris** has been named head of the western division in Denver with responsibility for the mountain states and California. **J. W. Barbour, Jr.,** Maracaibo, Venezuela, has been transferred to Dallas where he will be in charge of overseas and special-sales assignments for Core Lab.

Personals

W. H. Barlow, manager of research and planning and a director of Ohio Oil Co., has been elected a vice president. He will be in over-all charge of the company's chemicals, planning, and research. **Dr. R. H. Reitsema,** senior planning associate, has been named manager of the company's new chemical-product development division, which will be headquartered in Findlay, Ohio. In addition to the new division, Ohio will increase staff and facilities at its Denver research center to give greater emphasis to petrochemical work.

BARLOW

Vincent N. Hurd, director of technical development in Gulf Oil Corp.'s petrochemicals department, Pittsburgh, has been named manager of the new petrochemicals department of Gulf Eastern Co. in London. He will be responsible for petrochemicals activities in Europe and other areas of the Eastern Hemisphere. Hurd has been with Gulf since 1942.

Guy F. Willey, technical advisor to Esso Standard Italiana in Genoa, Italy, has been named operations superintendent for Humble in Charleston, S. C.

Gerald W. Sullivan, mechanical engineer for Shell Oil Co. in Houston, has joined Gulf Oil Corp. as reservoir engineer in Morgan City, La.

D. V. Crowley has been named district drilling engineer in Gulf Oil Corp.'s Houston production district. He succeeds **J. O. Crowe,** who has been named staff drilling engineer in the technical-services group, Houston. Crowley recently returned from Bolivia where he was in charge of drilling operations for Bolivian Gulf Oil Co.

D. S. Lyall, manager of British American Oil Co.'s economics and coordination department, has been named manager of research and services in the headquarters marketing department, Toronto. **W. P. Symons,** manager of direct sales in the company's Ontario division, has been named coordinator of direct sales in Toronto. **D. I. Watson** has been named special products representative in Vancouver. He will be responsible for marketing liquid petroleum products and sulfur in the West Coast area.

E. D. Pressler has been named coordinator of reserves, a new position in Humble's headquarters exploration department, Houston. Pressler has been serving with the southwestern region exploration department in Houston. He joined Humble as a field geologist in Uvalde, Tex., in 1928.

R. M. Touring, district geologist for Humble in Eugene, Ore., has been promoted to area geologist and transferred to Los Angeles.

Charles A. Burton, administrative assistant in Monsanto Chemical Co.'s plastics division engineering department, Texas City plant, has been named general supervisor of distribution for the Chocolate Bayou project near Alvin, Tex.

T. H. Kerlin, formerly with Tradewinds Drilling Co., has joined Rayna Drilling Co. as vice president. He will headquarter in Tulsa. Rayna Drilling has acquired rotary rigs operated by Tradewinds in the Mid-Continent, but Tradewinds will continue to operate seven rigs in the Rocky Mountain area.

Deaths

Massena B. Murray, 61, Oklahoma oil conservation director, died September 10 in Oklahoma City. (See p. 61.)

Lawrence V. Dirnberger, 69, retired operating manager of the old Socony-Vacuum Oil Co.'s eastern lakes division, died September 4. Dirnberger retired in 1954.

Dr. Leonard W. Doolan, 54, manager of Tidewater Oil Co.'s eastern division lubricants-supply department and a member of the division's council of executives, died September 3 at his home in Scotch Plains, N. J., after an illness of several months. Doolan had been with Tidewater 25 years.

Ole Berg, Jr., 57, Sunland Refining Corp. executive vice president, died September 3 in a Fresno, Calif., hospital, after a heart attack. Berg had been in poor health for the past year. He was with Union Oil Co. before joining Sunland.

James Kimbrough, 54, manager and co-owner of Michigan Well Log Service, Mount Pleasant, died August 28 after a heart attack.

John Franklin Sage, 63, engineer with Sinclair Production Research Laboratories in Tulsa, died September 10 in a Tulsa hospital. Sage entered the oil business with Prairie Oil & Gas Co. in 1919.

Heston Leroy (Iron) Singletary, 53, Tulsa independent oil man, died September 11 in a Tulsa hospital after suffering a heart attack.

William H. Morgan, 73, retired vice president of R. R. Bush Oil Co., pioneer developer of California's Signal Hill field, died September 6 in a Long Beach hospital after a long illness. Morgan retired in 1951.

Thomas B. Cochran, 67, Dallas independent oil operator, died August 29 in Wichita Falls, Tex.

Albert A. Thornton, 64, president of Laffoon Oil Co., died September 9 at his home in Oklahoma City.

Two members of a Parker Drilling Co. crew were killed and three are missing and presumed dead in the explosion of a Mobil Oil Co. gas well near Pecos, Tex., September 9 (see p. 60). Mobil says 96 were injured. Those killed were: **Pat York,** 39, Fort Stockton, Tex., area drilling superintendent; and **Hubert E. Whitfield,** 50, Lovington, N. M., tool pusher. Missing are: **Cecil Clark,** Lovington, N. M., driller; and **Donald H. Jackson,** Olney, Tex., and **Charles A. Ellithorpe, Jr.,** Monahans, floormen.

Shift to gas slows sales of distillates

BY JOHN C. CASPER

A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,170,825	UP	120,900	UP	178,445
Crude stocks	248,569,000	DOWN	2,300,000	UP	16,000,000
Completions	885	UP	107	DOWN	48
Refinery runs	8,437,000	DOWN	127,000	UP	166,000
Gasoline stocks	191,207,000	UP	927,000	UP	2,321,000
Kerosine stocks	35,529,000	UP	1,468,000	UP	1,008,000
Distillate stocks	157,562,000	UP	5,293,000	DOWN	1,546,000
Residual stocks	49,632,000	UP	326,000	UP	1,839,000
Four-product stocks	433,930,000	UP	8,014,000	UP	3,622,000
Total imports	1,745,300	UP	116,600	UP	363,500

INCREASES in sales of distillate heating oils slowed to a walk in the last half of the 1950-60 decade. In fact, distribution was in reverse for two of the districts.

Sales in the Rocky Mountain area and on the West Coast were lower in 1960 than in 1955. District 4 deliveries averaged 354,000 gal. daily in 1950 and climbed to 634,000 gal. daily in 1955 for an increase of 79%. By 1960, sales were back down to 602,000 gal. daily, a drop of 5.0% from the average for 1955.

On the West Coast, the district was credited with sales in Alaska and Hawaii for the year 1960, but distribution in these new states was not enough to prevent a drop in demand for distillate in the last half of the decade. District 5 sales were 2.6% lower in 1960 than in 1955.

In the other three districts, there was a definite slowdown in distillate's rate of growth. Sales in District 1 gained 56.4% between 1950 and 1955 but only 28.6% in the last half of the decade.

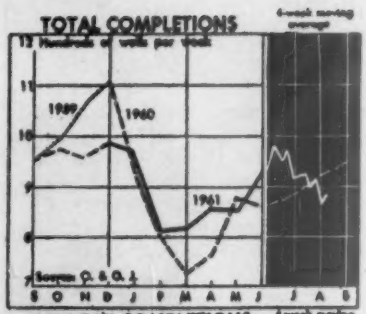
In District 2, the rate of gain dropped from 58.2% in the first 5 years to 23.8% in the last 5. This deceleration in Districts 1 and 2 had more influence on distillate production than the decreases for the other three districts, because most of the heating oil is sold in Districts 1 and 2. They accounted for almost 92% of 1960 heating-distillate sales.

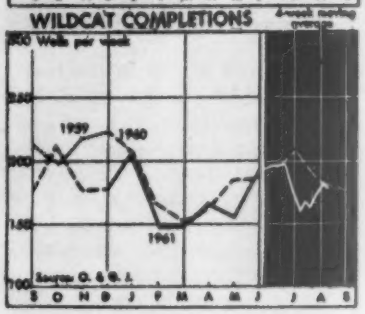
A large part of the distillate slowdown can be credited to sharp increases in domestic and commercial use of natural gas. Look for comparisons of gas sales on this page next week.

Sales of distillate heating oils in thousands of gallons per day

	1950	1955	1960	Per cent inc. 1955 over 1950	Per cent inc. 1960 over 1955
District 1					
Connecticut	995	1,539	2,406	54.7	56.3
Delaware	120	260	266	116.7	2.3
Dist. of Columbia	229	366	283	59.8	—22.7
Florida	124	259	273	108.9	5.4
Georgia	83	131	134	57.8	2.3
Maine	315	508	612	61.3	20.5
Maryland	823	1,452	1,112	76.4	—23.4
Massachusetts	2,064	3,459	5,337	67.6	54.3
New Hampshire	274	471	450	71.9	— 4.5
New Jersey	2,471	3,315	4,421	34.2	33.4
New York	4,428	6,195	7,760	39.9	25.3
North Carolina	230	550	981	139.1	78.4
Pennsylvania	1,839	3,234	3,773	75.9	16.7
Rhode Island	367	474	778	29.1	64.1
South Carolina	76	167	342	119.7	104.8
Vermont	98	158	290	61.2	83.5
Virginia	467	919	970	96.8	5.5
West Virginia	22	48	46	118.2	— 4.2
Total Dist. 1	**15,025**	**23,505**	**30,234**	**56.4**	**28.6**
District 2					
Illinois	1,522	2,194	3,196	44.2	45.7
Indiana	539	1,058	1,855	96.3	75.3
Iowa	529	729	827	37.8	13.4
Kansas	97	184	74	89.7	—59.8
Kentucky	70	140	121	100.0	—13.6
Michigan	1,132	2,051	2,663	81.2	29.8
Minnesota	1,045	1,411	1,065	35.0	75.5
Missouri	433	625	650	44.3	4.0
Nebraska	233	318	206	36.5	—35.2
North Dakota	121	204	215	68.6	5.4
Ohio	620	1,008	1,360	62.6	34.9
Oklahoma	20	54	32	170.0	—40.7
South Dakota	121	207	190	71.1	— 8.2
Tennessee	77	92	83	19.5	— 9.2
Wisconsin	769	1,319	1,812	71.5	37.4
Total Dist. 2	**7,328**	**11,594**	**14,349**	**58.2**	**23.8**
District 3					
Alabama	56	80	48	42.9	—40.0
Arkansas	13	35	15	169.2	—57.1
Louisiana	37	76	161	105.4	111.8
Mississippi	13	28	5	115.4	—82.1
New Mexico	12	19	57	58.3	200.0
Texas	135	154	218	14.1	41.6
Total Dist. 3	**266**	**390**	**504**	**46.6**	**29.2**
District 4					
Colorado	75	121	110	61.3	— 9.1
Idaho	113	224	272	98.2	21.4
Montana	76	107	103	40.8	— 3.7
Utah	60	127	97	111.7	—23.6
Wyoming	30	55	20	83.3	—63.6
Total Dist. 4	**354**	**634**	**602**	**79.1**	**— 5.0**
District 5					
Alaska	....	....	182	...	...
Arizona	52	32	26	—38.5	—18.7
California	588	518	394	—11.9	—23.9
Hawaii	....	....	8	...	...
Nevada	62	59	59	— 4.8	...
Oregon	619	759	680	22.6	—10.4
Washington	1,130	1,543	1,486	36.5	— 3.7
Total Dist. 5	**2,451**	**2,911**	**2,835**	**18.8**	**— 2.6**
Total U. S.	**25,424**	**39,034**	**48,524**	**53.5**	**24.3**

DRILLING





Active Rotary Rigs

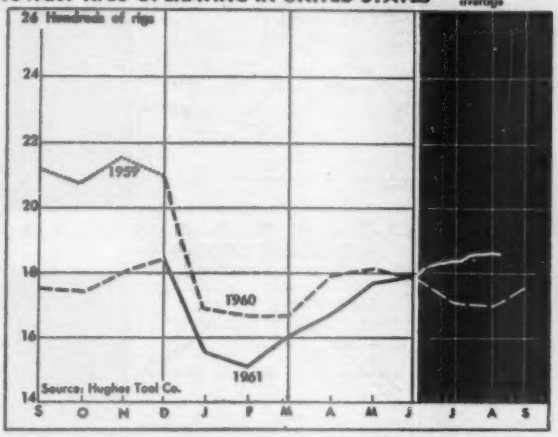
	9-11-61	9-4-61	9-12-60
Alabama	6	6	4
Alaska	13	12	7
Arkansas	12	10	9
Arizona	0	0	1
California	78	78	83
Land	75	73	81
Offshore	3	5	2
Colorado	29	31	50
Florida	2	2	2
Land	0	0	2
Offshore	2	2	0
Georgia	0	1	0
Illinois	48	43	44
Indiana	14	11	8
Iowa	1	1	0
Kansas	97	89	116
Kentucky	6	8	6
Louisiana	277	293	280
North	41	48	33
S. Inland waters	96	101	113
S. Land	81	85	80
Offshore	59	59	54
Maryland	0	0	1
Michigan	27	22	36
Mississippi	70	71	52
Missouri	1	1	2
Montana	21	30	24
Nebraska	21	25	25
Nevada	0	0	1
New Mexico	95	108	114
New York	1	1	2
North Carolina	1	1	0
North Dakota	12	13	15
Ohio	9	9	7
Oklahoma	215	217	150
Oregon	0	0	1
Pennsylvania	10	10	7
South Dakota	0	0	1
Texas	664	676	566
S. Inland waters	9	7	3
S. Land	189	189	143
Offshore	1	2	1
North	49	60	47
Panhandle	63	63	50
East	65	70	49
West Central	164	163	166
West	124	122	107
Utah	37	39	29
Washington	1	1	1
West Virginia	12	11	6
Wisconsin	1	0	0
Wyoming	67	62	64
Total U. S.	1,848	1,882	1,714
Cum. avg. to date		1,705	1,730
Western Canada	148	157	147
Eastern Canada	2	2	1
Grand total	1,998	2,041	1,862

Hughes Tool Co. report.

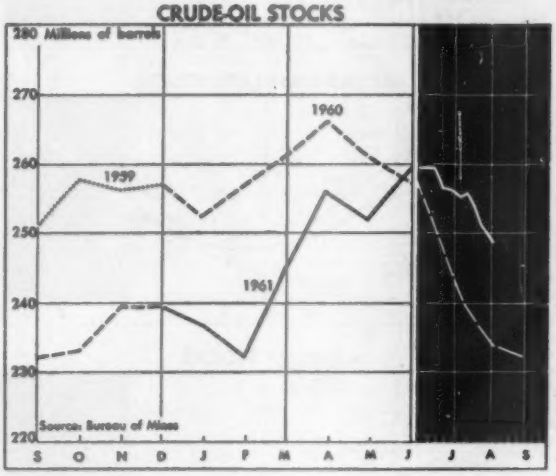
WEEKLY WELL COMPLETIONS . . . WEEK ENDED SEPTEMBER 9, 1961

	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1961	1960	Total	Crude	Cond.	Gas	Dry	1961	1960
Alabama	0	0	0	0	0	0	0	31	32	0	0	0	0	0	7	2
Alaska	0	0	0	0	0	0	0	30	.....	0	0	0	0	0	6	.....
Appalachian	33	13	0	10	0	10	55,252	1,434	1,235	0	0	0	0	0	52	47
Arizona	0	0	0	0	0	0	0	17	26	0	0	0	0	0	10	18
Arkansas	20	9	0	1	10	0	73,028	351	410	6	0	0	0	6	75	112
California	44	31	0	2	11	0	168,292	1,173	1,124	8	0	0	1	7	181	217
Colorado	11	3	0	3	5	0	52,874	419	435	2	0	0	1	1	194	220
Illinois	35	14	0	0	21	0	81,847	1,391	1,533	8	2	0	0	6	306	312
Indiana	17	4	0	0	13	0	26,827	509	708	4	1	0	0	3	133	258
Kansas	67	45	0	2	20	0	229,095	3,469	2,465	10	2	0	0	8	644	710
Kentucky	41	10	0	7	23	1	63,455	1,346	1,368	0	0	0	0	0	91	118
Louisiana	70	23	3	5	39	0	530,415	2,602	2,450	17	1	0	0	16	417	385
North	26	8	1	1	16	0	93,866	1,033	916	11	1	0	0	10	182	185
South	34	10	2	4	18	0	341,149	1,193	1,186	5	0	0	0	5	197	175
Offshore	10	5	0	0	5	0	95,400	376	348	1	0	0	0	1	38	25
Michigan	23	7	0	2	13	1	65,027	537	626	10	1	0	0	9	195	163
Mississippi	7	2	0	1	4	0	61,693	373	483	3	0	0	0	3	130	183
Montana	17	8	0	0	9	0	79,581	272	214	9	0	0	0	9	128	101
Nebraska	19	2	0	0	17	0	89,488	701	617	13	0	0	0	13	345	249
New Mexico	33	17	0	7	9	0	143,716	1,233	1,278	6	2	0	0	4	203	193
West	13	2	0	7	4	0	56,266	541	429	2	1	0	0	1	66	48
East	20	15	0	0	5	0	87,450	692	849	4	1	0	0	3	137	145
North Dakota	5	3	0	0	2	0	30,331	181	205	2	1	0	0	1	48	54
Ohio	18	7	0	6	5	0	42,978	717	734	0	0	0	0	0	33	36
Oklahoma	70	38	1	9	17	5	342,012	3,989	3,252	9	0	0	0	9	396	534
Texas	323	192	10	24	86	11	1,431,180	10,038	10,939	56	7	1	4	44	2,110	2,259
District 1	22	10	0	1	11	0	56,232	621	746	9	0	0	1	8	252	281
District 2	14	6	0	3	5	0	102,996	541	539	4	1	0	1	2	152	136
District 3	27	11	0	3	13	0	205,326	805	842	6	1	0	0	5	156	158
District 4	19	10	1	4	4	0	115,463	837	760	2	1	0	0	1	195	217
East	17	8	0	2	7	0	105,288	839	887	7	0	0	1	6	219	183
District 7-B	41	26	0	2	13	0	108,315	1,263	1,591	7	0	0	0	7	348	458
West	79	55	0	0	15	9	342,219	2,493	2,867	6	1	0	0	5	522	444
District 9	72	50	8	0	12	2	232,060	1,821	1,992	8	1	1	0	6	191	339
District 10	32	16	1	9	6	0	163,261	818	715	7	2	0	1	4	75	43
Utah	3	0	0	3	0	0	22,148	166	169	1	0	0	1	0	75	57
Wyoming	24	10	0	4	10	0	120,142	645	723	12	1	0	3	8	245	296
Misc. (Tenn.)	5	0	0	0	5	0	3,949	144	123	5	0	0	0	5	131	102
Total U. S.	885	438	14	86	319	28	3,713,330	31,768	31,149	181	18	1	10	152	6,155	6,626
Prev. week	778	330	2	82	330	34	3,328,591	.....	.....	179	19	0	6	154	.....	.....
Cum. 1961	31,768	14,235	636	3,114	11,471	2,312	128,414,928	.....	.....	6,155	551	63	276	5,265	.....	.....
Cum. 1960	31,149	14,178	919	2,551	11,910	1,591	131,606,751	.....	.....	6,626	584	74	220	5,748	.....	.....
Western Canada	90	50	0	22	17	1	514,073	1,572	1,623	16	4	0	2	10	385	429

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	9-2-61	8-26-61	9-3-60
Pennsylvania	2,452	2,486	2,323
Other Appalachian	1,438	1,451	1,511
Illinois, Indiana, Michigan	10,791	10,815	9,253
Nebraska and North Dakota	3,577	3,750	2,855
Kansas	9,104	8,992	8,679
Oklahoma	17,012	17,132	14,938
Arkansas	1,827	1,785	1,855
Louisiana	19,628	19,542	18,341
North	3,375	3,274	2,908
South	16,253	16,268	15,433
Mississippi, Alabama, Florida	3,466	3,362	2,036
New Mexico	8,916	8,072	7,836
Texas	105,975	105,938	98,034
East Texas	8,055	8,031	7,792
West Texas	47,679	48,524	46,847
Texas Gulf	18,455	18,409	16,333
Other Texas	31,786	30,974	27,062
Wyoming	16,553	16,602	14,893
Other Rocky Mountain	9,605	9,619	9,664
California	23,690	24,144	26,699
Foreign	†14,535	17,179	13,652
Total	248,569	250,869	232,569

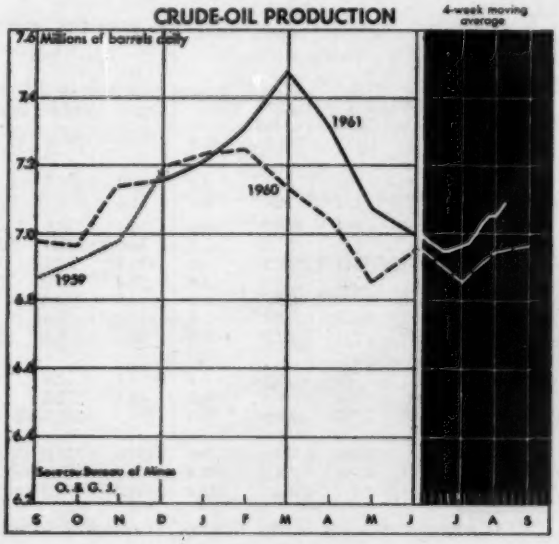
*Bureau of Mines. †Includes 4,361,000 bbl. in California.

DAILY AVERAGE PRODUCTION FOR WEEK

	September 9, 1961			
	Crude oil	Lease condensate	Total	Sept. 2 total
Alabama	17,100	.....	17,100	17,025
Alaska	21,500	.....	21,500	21,300
Arkansas	75,025	125	75,150	75,100
California	814,000	.....	814,000	813,300
Colorado	126,800	.....	126,800	126,000
Eastern	40,500	.....	40,500	39,400
Florida	1,000	.....	1,000	1,000
Illinois	214,800	.....	214,800	214,600
Indiana	30,000	.....	30,000	30,400
Kansas	†306,375	.....	†306,375	†304,200
Kentucky	50,900	.....	50,900	51,400
Louisiana	1,010,000	154,950	1,164,950	1,134,650
North	105,725	5,500	111,225	111,150
South	904,275	149,450	1,053,725	1,023,500
Michigan	53,100	.....	53,100	53,300
Mississippi	146,000	4,000	150,000	150,250
Montana	87,000	.....	87,000	85,800
Nebraska	64,000	.....	64,000	63,700
Nevada	400	.....	400	400
New Mexico	300,500	7,500	308,000	321,500
North Dakota	58,800	.....	58,800	57,900
Oklahoma	†514,900	.....	†514,900	†495,600
Texas	2,490,000	90,400	2,580,400	2,507,650
Dist. 1	43,000	2,700	45,700	44,600
Dist. 2	105,000	8,000	113,000	107,900
Dist. 3	327,000	38,000	365,000	350,000
Dist. 4	181,000	13,000	194,000	188,500
Dist. 5	27,000	650	27,650	27,600
Dist. 6	117,000	8,000	125,000	121,000
East Texas field	129,000	.....	129,000	128,000
Dist. 7-B	129,000	400	129,400	125,400
Dist. 7-C	109,000	3,450	112,450	106,450
Dist. 8	1,022,000	12,000	1,034,000	1,006,000
Dict. 9	194,000	2,500	196,500	195,500
Dist. 10	107,000	1,700	108,700	106,700
Utah	85,400	.....	85,400	79,800
Wyoming	405,200	.....	405,200	405,000
Others	‡550	.....	‡550	‡650
Total U. S.	6,913,850	256,975	**7,170,825**	7,049,925
Change from prev. week, up			**120,900**	
Canada	†571,200	.....	†571,200	†644,000
Total U. S. prod.—Jan. 1-Sept. 9				1,812,794,900 bbl.
Same period last year (crude plus cond.)				*1,777,247,500 bbl.

*Includes 57,299,500 bbl. condensate. †Week ended previous Monday. ‡South Dakota and Arizona.

CRUDE-OIL PRODUCTION



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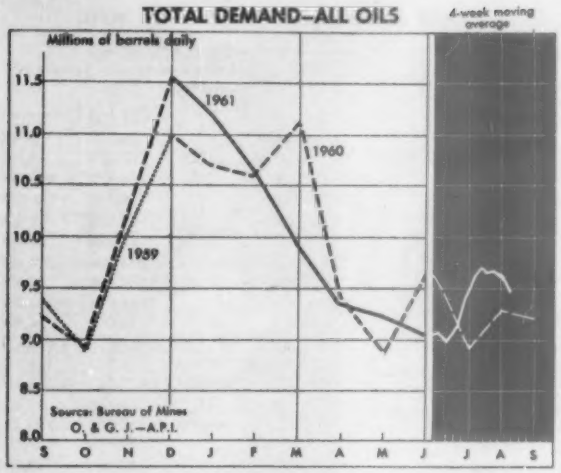

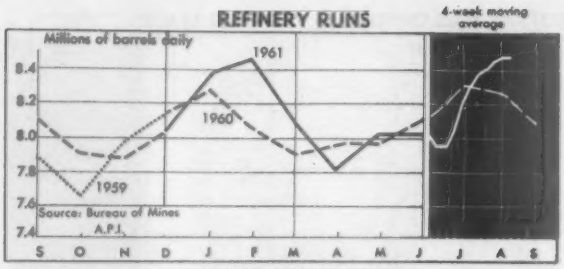

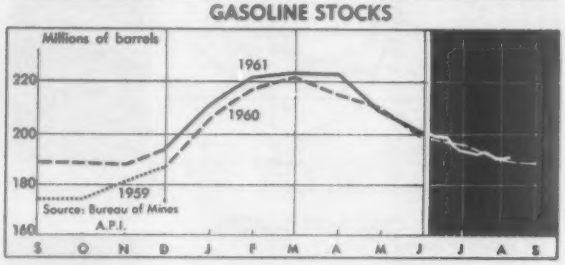

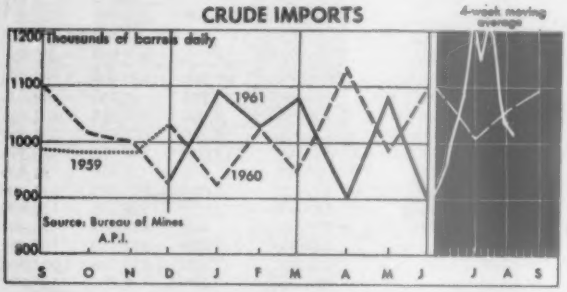

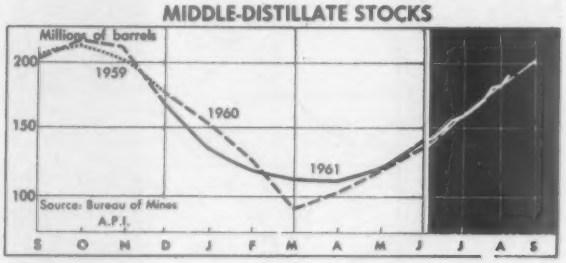

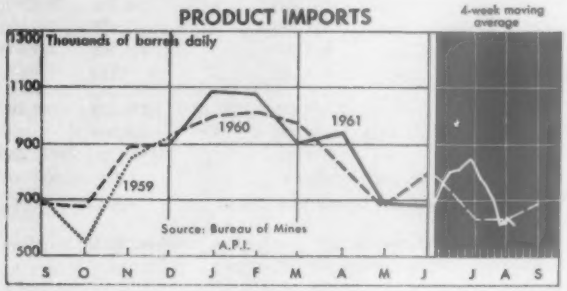

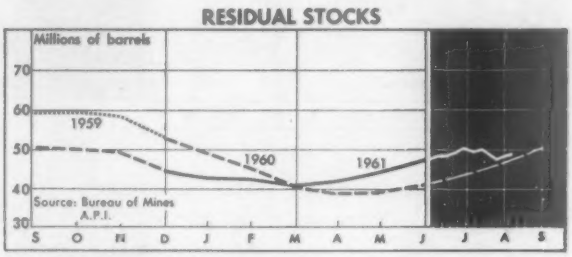

API REFINERY REPORT—SEPTEMBER 8, 1961

(Thousands of barrels)

District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, September 1960 Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,175	545.3	38.9	353.6	150.9	47,705	13,725	57,344	13,097	1,165	510.5	30.7	337.7	131.6
Appalachian:														
District 1	105	46.6	4.9	23.7	7.7	5,165	695	3,563	386	94	41.6	3.3	22.9	6.6
District 2	104	56.4	3.9	21.4	9.1	2,819	445	1,605	310	107	55.3	5.2	20.3	10.3
Ind., Ill., Ky.	1,554	816.7	84.6	354.4	130.6	31,846	7,273	28,950	5,445	1,473	787.3	68.4	318.5	130.9
Minn., Wis., Dak.	132	57.1	2.1	34.6	19.4	6,737	1,728	8,213	663	117	54.3	3.9	28.5	15.6
Okla., Kans., Mo.	745	447.3	16.0	170.7	23.1	17,641	1,960	12,709	1,038	738	415.5	7.9	190.1	19.0
Inland Texas	308	210.4	8.6	51.4	21.3	7,231	718	1,727	2,711	296	231.0	9.6	47.7	21.3
Texas Gulf Coast	2,024	959.1	136.4	544.9	124.4	24,846	3,804	17,203	5,358	1,850	977.9	125.0	453.7	138.5
La. Gulf Coast	630	368.3	58.8	150.4	35.4	10,190	1,996	5,859	1,141	646	363.8	63.5	147.1	40.1
N. La. and Ark	113	62.7	5.0	23.2	5.9	5,863	764	2,334	189	108	63.7	7.3	19.5	7.6
Rocky Mountain:														
New Mexico	26	13.9	0.4	4.3	2.6	658	38	180	63	22	11.9	0.3	4.2	2.1
Other Rocky Mt.	294	139.9	6.0	63.7	32.3	5,552	684	3,089	1,141	294	142.5	2.9	63.5	29.7
West Coast	1,227	600.9	58.0	154.3	265.3	24,954	1,699	14,786	18,090	1,190	544.1	31.2	177.2	306.0
Sept. 8, 1961	8,437	4,324.6	423.6	1,950.6	828.0	191,207	35,529	157,562	49,632	8,100	4,199.4	359.2	1,830.9	859.3
Sept. 1, 1961	8,564	4,378.3	366.6	1,966.9	808.6	190,280	34,061	152,269	49,306	.....	.....	.....	.....	.....
Sept. 9, 1960	8,271	4,286.3	397.6	1,849.0	892.9	188,886	34,521	159,108	47,793	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

CRUDE-OIL PRICES
GRAVITY SCHEDULE

	Signal Hill, Calif.	Oklahoma	West Tex. (sour)	West Tex. (inter.)	No.* Texas	Texas Refugio Light	Bayou Sale (La.)	Denver Julesburg	Wyo. (sour)
14.14.9	$1.86	....	....	....	....	....	....	....	....
15-15.9	1.93	....	....	....	....	....	....	....	$1.81
16-16.9	2.00	....	....	....	....	....	....	....	1.86
17-17.9	2.06	....	....	....	....	....	....	....	1.91
18-18.9	2.13	....	....	....	....	....	....	....	1.96
19-19.9	2.20	....	....	....	....	....	....	....	2.01
20-20.9	2.27	$2.49	$2.35	$2.61	$2.29	$2.95	$2.90	$2.58	2.06
21-21.9	2.33	2.52	2.38	2.63	2.33	2.97	2.92	2.60	2.11
22-22.9	2.40	2.55	2.41	2.65	2.37	2.99	2.94	2.62	2.16
23-23.9	2.46	2.58	2.44	2.67	2.41	3.01	2.96	2.64	2.21
24-24.9	2.53	2.61	2.47	2.69	2.45	3.03	2.98	2.66	2.26
25-25.9	2.60	2.64	2.50	2.71	2.49	3.05	3.00	2.68	2.31
26-26.9	2.67	2.67	2.53	2.73	2.53	3.07	3.02	2.70	2.36
27-27-9	2.74	2.70	2.56	2.75	2.57	3.09	3.04	2.72	2.49
28-28.9	2.81	2.73	2.59	2.77	2.61	3.11	3.06	2.74	2.54
29-29.9	2.87	2.76	2.62	2.79	2.65	3.13	3.08	2.76	2.59
30-30.9	2.93	2.79	2.65	.281	2.69	3.15	3.10	2.78	2.63
31-31.9	3.00	2.82	2.68	2.83	2.73	3.17	3.12	2.80	2.67
32-32.9	3.06	2.85	2.71	2.85	2.77	3.19	3.14	2.82	2.71
33-33-9	3.12	2.88	2.74	2.87	2.81	3.21	3.16	2.84	2.75
34-34.9	3.17	2.91	2.77	2.89	2.85	3.23	3.18	2.86	2.79
35-35.9	3.22	2.94	2.80	2.91	2.89	3.25	3.20	2.88	2.83
36-36.9	3.27	2.97	2.83	2.93	2.93	3.27	3.22	2.90	2.87
37-37.9	3.31	2.99	2.86	2.95	2.95	3.29	3.24	2.92	2.89
38-38.9	....	3.01	2.89	2.97	2.97	3.31	3.26	2.94	2.91
39-39.9	....	3.03	2.92	2.99	2.99	3.33	3.28	2.96	2.93
40-44.9	....	3.05	2.95	3.01	3.01	3.35	3.30	2.98	2.95

*Cooke, Grayson, Montague.

FLAT PRICES

Louisiana:	
Sweet Lake	$3.00
Texas:	
East Texas	3.05-3.25
Conroe	3.23-3.53
Van	3.08
Pennsylvania Grade:	
Bradford	$4.80
Middle District	4.52
Southwest Pennsylvania	4.25
West Virginia	4.17
Buckeye Grade	4.08
Illinois Basin	3.00-3.05

FOREIGN

Middle East, Persian Gulf: (cargoes f.o.b. lifting port)	
Arabian, 34.0°-34.9°, Ras Tanura	$1.80
Iranian, 34.0°-34.9°, Bandar Mashur	1.78
Iranian, 34.0°-34.9°, Abadan	1.73
Iraq, 35.0°-35.9°, Fao	
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.59
Qatar, 41.0°-41.9°, Umm said	1.95
Middle East, E. Mediterranean:	
Arabian, 34.0°-34.9°, Sidon	$2.17
Iraq, Mosul-Kirkuk, 35.0°-35.9°, Tripoli	2.19
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 36°	2.42
Canada:	
Leduc-Woodbend	$2.53
Redwater (Alta.)	2.42
Weyburn (light)	2.085
Midale C	1.71
Venezuela:	
Cumarebo, 47°-47.9°, Tucupido	3.34
San Joaquin, 40°-40.9°, Puerto La Cruz	3.08
Oficina, 35°-35.9°, Puerto La Cruz	2.80
Tia Juana medium, 26°-26.9°, Amuay*	2.30
Quiriquire, 16.0°-16.4°, Caripito	2.10
Lagunillas heavy, flat, Las Piedras*	2.10
Bachaquero, flat, 15°-16°, Las Piedras*	1.88

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

TANKER RATES (Long ton)

(Latest reported spot fixtures)

★ Gulf-NY, dirty (ATRS – 12.5%)	$2.49
★ Carib.-NY, dirty (ATRS – 52.5%)	1.31
★ Carib.-UK, clean (Scale–33.75%) (22s. 6d.)	3.01
PG-UK, dirty (Scale–55%) (27s. 9d.)	3.89
PG-Japan, dirty (USMC – 72.5%)	2.81

★ Denotes change from previous week.

REFINED PRODUCTS

Following quotations are realistic spot prices for refined products moving interstate on Wednesday each week. They may differ from refiners' posted prices and should not be considered as postings.

Light-product prices are in cents per gallon. Residual and crude prices are dollars per barrel. Crude prices are at the well unless other wise listed.

GASOLINE*

Mid-Continent (Group 3):	
★ Regular (91 octane)	10.25-10.75
★ Premium (99 octane)	13.00-13.50
Natural gasoline (26-70)	4.5
Breckenridge	4.0
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	10.50-11.00
Regular (92 octane)	10.75-11.25
Premium (98 octane)	11.75-12.25
California (rack) Los Angeles:	
Regular (90 octane)	11.60
Premium (94 octane)	12.60
Premium (100 octane)	14.10
Caribbean area (cargoes):	
Regular (87 octane)	9.00
Premium (97 octane)	11.50

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	9.50-9.75
Diesel oil (58 d.i. and above)	9.00-9.25
Distillate No. 1	9.00-9.25
Distillate No. 2	8.25-8.50
Gulf Coast (cargoes):	
Kerosine 41-43	9.50
Distillate No. 2	8.50
New York Harbor (barges):	
Kerosine 42-43	11.20
Distillate No. 2	10.20
Diesel fuel, 48-52 d.i.	10.35
Caribbean area (cargoes):	
Distillate No. 2	8.10

RESIDUAL FUEL

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$1.65-1.75
Gulf Coast (cargoes):	
Bunker C fuel	2.20-2.30
New York Harbor (barges):	
Bunker C fuel	2.52
Caribbean (cargoes):	
Bunker C fuel	2.00
California (rack):	
Bunker C fuel, Los Angeles	2.25

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FOR SALE EQUIPMENT

USED GAS PROCESSING Equipment: Glycol and Dry Dessicant Dehydrators; Quick-cycle Hydrocarbon Recovery Units; Water Flood Filter-pump Units. Also new oil and gas production equipment. Engineered Specialties Co., P. O. Box 35683, Phone FL 1-5284, Dallas 35, Texas.

XVG-6 Ingersoll-Rand gas compressor with cylinders to fit requirements. Worthington 7" x 9" skid electric driven gas compressor. Alfred B. Kern, 305 Kennedy Building, Tulsa, Oklahoma.

TWO WATER Injection Triple Pumps, used, excellent condition: each 500 GPM at 1,200 PSIG, with 400 HP electric motor or 500 HP natural gas engine drive. Engineered Specialties Co., P. O. Box 35683, Phone FL 1-5284, Dallas 35, Texas.

FOR SALE EQUIPMENT

OIL Drilling Rig, National 40. For sale, cash or trade. SP 3-1245, TO 2-2191 (L.A.)

2500 FAILING, 58' mast, 5 x 8 pump, $25,000.00. Failing 1500 42' mast. Box 383, Chanute, Kansas.

One A. O. Smith Absorber 5'2" x 32'1" all welded SS 2-1 4" Shell 12 Trays with Mist Extractor Text Pressure 2260#—$15,000.00

American Petrofina Company of Texas

P. O. Box 1011, Mt. Pleasant, Texas

FOR SALE EQUIPMENT

SPECIAL SALE—New Bethlehem A.P.I. Pumping Units—6,400—10,000—16,000—25,000 inch lb. Torque Ratings. Prices and specifications on request—Contact Persinger Supply Company, Box 491—Williamson, W. Va.—Telephone BElmont 5-1400.

150,000'—⅝" USED SUCKER RODS, ⅞" Box & Pin, 25' Uniform, No. 1, @ $6.50 CFT, F.O.B. Columbus, Ohio
Subject Prior Sale
WIRE, PHONE COLLECT, WRITE
Columbus Steel Supply Company
1000 Bonham Avenue
Columbus 3, Ohio AX 4-4461

LIQUIDATION
at ESSO REFINERY Balto., Md.

MOST EQUIPMENT NEW 1956

TOWERS—30" to 84" diameter, 20' to 97' high, 7 to 34 trays, up to 360 PSI

DRUMS—3' to 12' diameter, 12' to 45' long to 530 PSI, some lined—some NEW

PETRO-CHEM FURNACES—30.7; 19.3; 10.4; 9.7; 7.5 MM BTU/Hr.

NEW FURNACE TUBES—4000'—⅜" & ½" Wall Croloy 5—4" to 6"

PUMPS—88 to 400 GPM up to 2040' head—up to 8 Stage

HEAT EXCHANGERS—CONDENSERS

Stainless Tubes	—235 to 2320 Sq. Ft.
Croloy 5 Tubes	—573 to 1040 Sq. Ft.
Admiralty Tubes	—216 to 1640 Sq. Ft.
Steel Tubes	—238 to 2240 Sq. Ft.

COMPRESSORS & BLOWERS

7500CFM @ 42.5PSIG, 1250HP Synch.
129CFM @ 193PSIA Worth. HB 7½x9

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Little Rock, Arkansas

11—28,000 gal. horiz. tanks, 11' x 38', dished, ASME 75 psi.
3—Worthington #LTC-4 air comp., 3,500 CFM, 24 x 15, 500 HP, nat. gas driven.
50—Heat exchangers, T316 Stainless, up to 2,000 sq. ft.

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PAN AMERICAN PETROLEUM
SWEENY, TEXAS, GASOLINE PLANT

ABSORBERS

4—	4' x 62'	2250# Absorbers
1—	5' x 55'	563# Absorber
1—	3' x 54'	500# Absorber
1—	5'6" x 53'	200# Absorber
1—	4' x 64'	60# Absorber

VESSELS

1—	5' x 22'	2000# Separator
1—	4' x 40'	1250# Separator
2—	4' x 10'	1500# Separator
2—	11' x 28'	50# Drums
1—	12' x 26'	200# Drums

Other small high pressure drums

ATMOSPHERIC EXCHANGERS

9—293	sq. ft.	2500# WP
12—324	sq. ft.	2500# WP
8—324	sq. ft.	1500# WP
50—720	sq. ft.	150# WP
30—460	sq. ft.	150# WP

SHELL & TUBE EXCHANGERS

12—1,690	sq. ft.	steel 400# WP
6—3,570	sq. ft.	steel 300# WP
4—1,900	sq. ft.	Adm 300# WP
2—4,000	sq. ft.	Adm 75# WP

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1—Carrier Refrigeration Compressor MODEL 18P301 400 hp., coolers and condensers
Approximately, 50 process pumps up to 1540 GPM and 3,700 ft. head
A large selection of gate, check and plug valves

—WIRE—PHONE—WRITE—

BRILL EQUIPMENT COMPANY
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28L PORTABLE. New Condition. Completely and fully equipped with all tools including Truck, Trailer, Doghouse, Forge and Power Plant. Call Bill Roberts, Glasglow, Ky. telephone OL 1-3850.

WILL SELL OR TRADE for producing properties in Kansas or Oklahoma, a 1955 Bethlehem S-45 Rotary with GM power, completely equipped to drill easily 5,000'. Operator has drilled only 46 wells with this excellent rig. Twin Drilling, Inc., 1005 Central Building, Wichita, Kansas.

FOR SALE—100 miles of 6⅝" O.D. #18.97 T.&C. in the ground or to your Specification. Weiner Brothers, 1017 Empire Bldg., Pittsburgh 22, Pa.

FAILING 2500, 1500, Trucks, Floats, Drill Pipe, Collars, and related Equipment. Survey Drilling Company, 2033 Hawes Avenue, Dallas 35, Texas.

50,000 FT.' 20 inch No. 1 grade used pipe. Lengths 20 ft. square cut ends. Weight 78# to the ft. High Tensile Pipe. Indiana-Ohio Pipe Co., P. O. Box 5462 Shep. Sta., Columbus 19, Ohio. Phone CL 3-5527—CL 3-5528.

SALE OR LEASE

1-48L and 1-36L Bucyrus Erie Spudders and 1 oil well 66 rotary rig. Write Keta Gas & Oil Company, Box 250, Bradford, Penna.

28—Complete assortment Heat Exchangers. Must Sell Now. Steel-Admiralty-Red Brass-Moly-Chrome Tubes. 200 to 1167 sq. ft.

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AT N. LITTLE ROCK, ARKANSAS

3—Worthington #LTC-4 compressors, 3500 CFM @ 45 PSI, 24 x 15, 3-cyl., 500 HP, 4-cycle. gas-engine drive.

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Order direct or from your supply store

Free sample on request

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Dismantled, Matchmarked For Reerection $75.00 N.T.
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1—NATIONAL T-32 rig, complete, excellent condition. Located in Kansas. Inventory and price upon request. P. O. Box 297, Tulsa 1, Oklahoma.

AN INVESTMENT! Productive advertising is an investment rather than an expenditure. Experienced oil men have found that The Oil and Gas Journal is their best classified advertising medium.

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WISH TO PURCHASE: Approximately 500 10-¾-inch linepipe collars. Contact Oiltex Supplies, Inc. for details, 1109 City National Building; 322-5288, Wichita Falls, Texas; 767-4306.

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OIL JOB DIRECTORY, foreign and domestic, showing where to apply for jobs $5.00 cash OIML Co., Box 2603, Tulsa, Oklahoma.

DRILLING & PRODUCTION SUPERINTENDENT

Immediate Opening

NEW PHILIPPINE OIL FIELD

Minimum of 5—10 years experience required, preferably in Middle or Far East. Excellent Opportunity. Airmail complete resume with salary requirements and indicate how soon available for employment.

AMERICAN ASIATIC OIL CORPORATION
Suite 2308
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NEW YORK, N. Y.

or

520 San Luis, Ermita
MANILA, PHILIPPINES

HELP WANTED

OIL FIELD EQUIPMENT Mechanics. Salary based on experience and ability. Box M-551, The Oil and Gas Journal, Tulsa, Oklahoma.

PROCESS ENGINEER

Refinery Process Engineer with chemical engineering degree and minimum of 4 years experience for a modern refinery in Michigan. Furnish resume of education, experience, references and salary requirements to:

Box M-556, The Oil and Gas Journal
Tulsa, Oklahoma

SENIOR COST ESTIMATOR

Northern Natural Gas Company has a position immediately available for an experienced cost estimator. Prefer degree in engineering. Requires a minimum of five years' cost estimating on gasoline and processing plants, pipelines and compressor stations. Continued growth, expansion and diversification present a challenging future for the right man. All qualified applicants will be considered, regardless of race, color, creed or national origin. Submit resume with complete salary history to:

Northern Natural Gas Company
J. Alan Hansen
P. O. Box 308, Omaha 1, Nebraska

REFINERY CHEMIST
VENEZUELA

Affiliate of Sandard Oil Company (N. J.) has opportunity for an experienced chemist to work in their refinery control laboratory. Candidates must have degree in chemistry with emphasis on analytical training. Minimum three years industrial experience with broad background instrumental and spectrographic methods as well as conducting tests and in duplicating instrument and chemical techniques. Working knowledge electronics. Practical experience in wet chemical analysis desired.

Liberal salary, benefit plans and annual home vacation with travel allowance. Interviews will be arranged for qualified candidates. All replies confidential. Send complete resume to:

P. O. Box 518 Department L
Radio City Station
New York 19, N. Y.

● MECHANICAL ENGINEER

● CHEMICAL ENGINEER

Positions now available on expanding staff of independent oil refining company in Upper Midwest area.

Graduate MECHANICAL ENGINEER with two to five years experience in petroleum refinery or related engineering. Will be responsible for mechanical design and cost estimate of refinery processing equipment in Engineering department.

Graduate CHEMICAL ENGINEER with two to five years petroleum refining or petrochemical experience. Will do process studies and other technical service for operating units, plus varied staff work in Technical Service department.

These engineers will work closely with operation of a modern, integrated refinery which includes crude distillation, catalytic cracking, polymerization, coking, hydrodesulfurization, catalytic reforming, alkylation and utilities.

Furnish complete resume of experience and education, including salary requirements.

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ATTN: C. L. DRETZKE

P. O. Box 3596
ST. PAUL 1, MINNESOTA

HELP WANTED

ASSISTANT MANAGER of Production Department wanted by Tulsa-based company. This is a responsible position requiring petroleum engineering degree, and minimum 10 years experience as petroleum engineer. Duties include supervision of field operations devoted almost entirely to waterflooding, plus substantial office petroleum engineering. Good starting salary with attractive future with aggressive and expanding company. Reply: Box M-550, The Oil and Gas Journal, Tulsa, Oklahoma.

DEPARTMENT HEAD
REFINERY EQUIPMENT INSPECTOR

Graduate engineer with minimum 5 years experience in inspection of all types of refinery equipment. Must have thorough understanding of applicable codes and pressure vessel design, API standards, etc. Modern midwest refinery. Furnish resume of education, experience, references and salary requirements to:

Box M-567, The Oil and Gas Journal, Tulsa, Oklahoma

PIPE INSPECTOR AND FIELD PURCHASING AGENT

Experience preferred. Must be willing to travel. Send complete resume to Columbus Steel Supply Co., P. O. Box 14526, Columbus, 3, Ohio.

PROJECT ENGINEERS

Graduate Mechanical, Electrical and Civil Engineers with 5 to 8 years' experience in detail design on pipeline and plant facilities. Company's continued growth and diversification require supervisory potential. Permanent position with good schools and housing. All qualified applicants will be considered regardless of race, color, creed or national origin. Submit resume with complete salary history to:

J. Alan Hanson
Northern Natural Gas Company
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Omaha 1, Nebraska

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(sub-contract)

Requires heavy experience in sub-contract administration as well as petroleum-chemical purchasing experience.

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resume immediately including salary required to purchasing personnel.

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LOS ANGELES

SITUATIONS WANTED

GEOLOGIST, 32, single, Colombian, good references, 6 years, experience U. S. and Latin America, exploration, development, production, water flood, would represent oil field equipment and services in Latin America. Working in Argentine. Apartado Aereo 6074 Bogota, Colombia.

PALEONTOLOGIST, 44 single, desires overseas position with oil company. 15 years experience with Tertiary and Cretaceous Foraminifera, and ammonites, in California, Colombia and Libya. Some field and wellsite work. Knows Spanish, learning Arabic. Box M-465, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

GEOLOGIST, M.A., 45, family, 22 years experience major and independents, all phases exploration, management, entire U. S. and Canada. Relocate anywhere, prefer Calgary, Denver. Box 652, Midland, Texas.

GEOLOGIST—Exploration thirteen years diversified experience Gulf Coast, Mississippi, Alabama, North Louisiana. Emphasis south Louisiana gulf coast. Will relocate. Complete resume on request. Box M-577, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM GEOLOGIST, Ph.D., 14 years experience USA and Venezuela. Exploration, basin evaluation, airphoto interpretations, reservoir studies, subsurface interpretations, mapping, reserves, drilling programs, reports. Desires position USA or foreign. Box M-576, The Oil and Gas Journal, Tulsa, Oklahoma.

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MECHANICAL ENGINEER, age 33, over 14 years diversified experience in foreign and domestic petroleum refineries, last 4½ years in responsible management positions. Available now to relocate anywhere U. S. For complete resume write: 607 East Cherry St., Robinson, Illinois.

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INVEST IN PROVEN fields Ritchie and Calhoun Counties, W. Va. Drilling to Big Injun and Berea. Paid $4.17 bbl. and 25 cents M. P. O. Box 215, Wheeling, W. Va.

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(Fractional undivided interests may be available in the future, but will be offered by prospectus only and only if, as and when, and only in states where, they may be legally offered in compliance with the securities laws of such states.)

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ONE THIRTY-SECOND (1/32) override for sale under one hundred thousand acres in Ohio and West Virginia. David Law, 716 Union Trust Building, Parkersburg, W. Va.

NEED PARTNER with tax dollars to drill wells in West Virginia and Ohio at actual cost. Wildcat and semi-proven acreage. David Law, 716 Union Trust Building, Parkersburg, W. Va.

FINANCIAL—Investment Banking Houses and Underwriters reached. Confidential. You can send the details of your proposition direct or thru your attorney to Consultant 817—51st Street, Brooklyn, N. Y.

FOUR WELLS in Bartlesville Sand on 80 acre lease in Glennpool area of Creek County, Oklahoma, now under pilot waterflood. Interested in expanding operations. Will associate with experienced operator with drilling tools, equipment and capital. In vicinity of several successful floods. Additional acreage available. Box M-557, The Oil and Gas Journal, Tulsa, Oklahoma.

SELL OR TRADE ½ undivided mineral rights 8,960 acres Hudspeth County, Texas. Owner B. O. Moore, Box 777, San Angelo, Texas.

SPECIAL OFFER to small or large inventors; working interest for only $375 per ½ to drill oil well on West extension of Oak Grove pool where wells have been flowing 80 to 150 bbls per day. Details, Write L-Snavely, Box 315, Coweta, Oklahoma.

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PRODUCER NEEDS associates to develop proven 160 acres. Bartlesville sand 750' deep, one well already drilled ready for completion Labette County, Kansas. For particulars write: Box M-547, The Oil and Gas Journal, Tulsa, Okla.

ST. LOUIS GROUP with substantial production interested in purchasing primary and secondary oil reserves in Illinois, Indiana, Kentucky or West Virginia. Can handle properties of any size. All replies confidential and all material forwarded will be returned. Box M-575, The Oil and Gas Journal, Tulsa, Oklahoma.

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Individual desires up to 25% interest in prospects being drilled before December 15th. Submit only ventures based on sound geology. Prefer extensive acreage and large potential per well. Deal and offeror must stand rigid inspection. Reply to:

EDMUND OIL & GAS
Attention G. R. Stocker, Geologist
P. O. Box 99, Barrington, New Jersey
Telephone: Area Code 609, Lincoln 7-3230

Producing royalty and unleased minerals, 9 wells, 13,000 acre block, Gains County, Texas. ⅛th interest for $20.00 per net mineral acre. Leagues 304, 305, and 306, Dawson County School Lands, about 7,000 acres open for leasing, of which purchaser would have ⅛th. Excellent investment for trusts, etc. Rebel Oil Company, Box 96, Hobbs, New Mexico. Principals only.

Box M-573, The Oil and Gas Journal Tulsa, Oklahoma

OIL AND GAS **JOURNAL**
Box 1260
TULSA, OKLAHOMA

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- ☐ We sell equipment.
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CITY _____ ZONE ___ STATE _____

LEASE AND DRILLING BLOCKS

SEVERAL LEASE BLOCKS, southeast Georgia, for sale, or drilling deals. Rotary drilling 4,000' slim hole, gas and oil seepages in aren. T. R. Davis, P. O. Box 503, Phone 3639, Vidalia, Georgia.

DO YOU WANT production? Several leases Berea, 21' Sand, 19' Saturation, Core Analysis 6,800 barrels per acre. Offset to four million Big Injun well, rock pressure 600 pounds. Harry Wines, 703 Red Oak Street, Charleston, West Virginia, Phone night, DI 3-0348.

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CONCESSIONS ON untested sedimentary basin of Central America. Write, Don C. Sargent, 314 Paramount Bldg. Denver 2, Colorado.

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FOR LEASE: 3458 Acres on the East Bank of the Pecos River, Block 2, Val Verde County, Texas. For Sale: ½ of 15/16th (357 acres) undivided interest in 3042.89 acres West Bank, Pecos River, Block 2. Payne and Payne, 2100 B. Kenwood, Austin, Texas.

ARIZONA—Big "Helium" lease play. Leases Available near Majors $1.00 acre. Terms—Free Maps. Edward Colson, 1716 W. Devonshire, Phoenix, Arizona.

ARIZONA HELIUM, state land, 5 year leases only 25 cents an acre annual rent. In Apache County where Kerr-McGee plant is now building. Free Information. John L. Donaghue, 430 16th Street, Denver 2, Colorado.

PRODUCTION WANTED

WANTED TO BUY—Up to $1,500,000 available for purchase of oil and gas producing leases. Must be good production with a good payout. Not interested in speculative or marginal properties. Box M-574, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: marginal or isolated production. Fast quotes, good prices. Contact Joe A. Huitt, 1306 Philtower, LU 7-3080, Tulsa, Oklahoma.

REAL ESTATE

PRIME QUALITY OFFICE BUILDING

offered for trade tax-free for producing royalty. Value $800,000, will trade with or without mortgage $275,000. Modern all respects, well rented, located Texas. Please submit information regarding royalty offered by absentee owner for trade.

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U. S. DEPARTMENT OF THE INTERIOR, Bureau of Indian Affairs, Crow Indian Agency, Crow Agency, Montana. Sealed bids will be received until September 28, 1961, 2:00 o'clock, P.M., Mountain Standard Time, and opened at that time in the office of the Crow Indian Agency, Crow Agency, Montana, for the leasing of 19,031.79 acres of tribal lands and 40 acres of allotted lands all located in Twp. 6 S., Rge. 32 East and Twps. 9 and 10 South, Rges. 37 and 38 East, Big Horn County, Montana, for oil and gas mining purposes. The details of the lease offering and how and where to file bids may be obtained by addressing the inquiry to the Superintendent of Crow Indian Agency, at Crow Agency, Montana.

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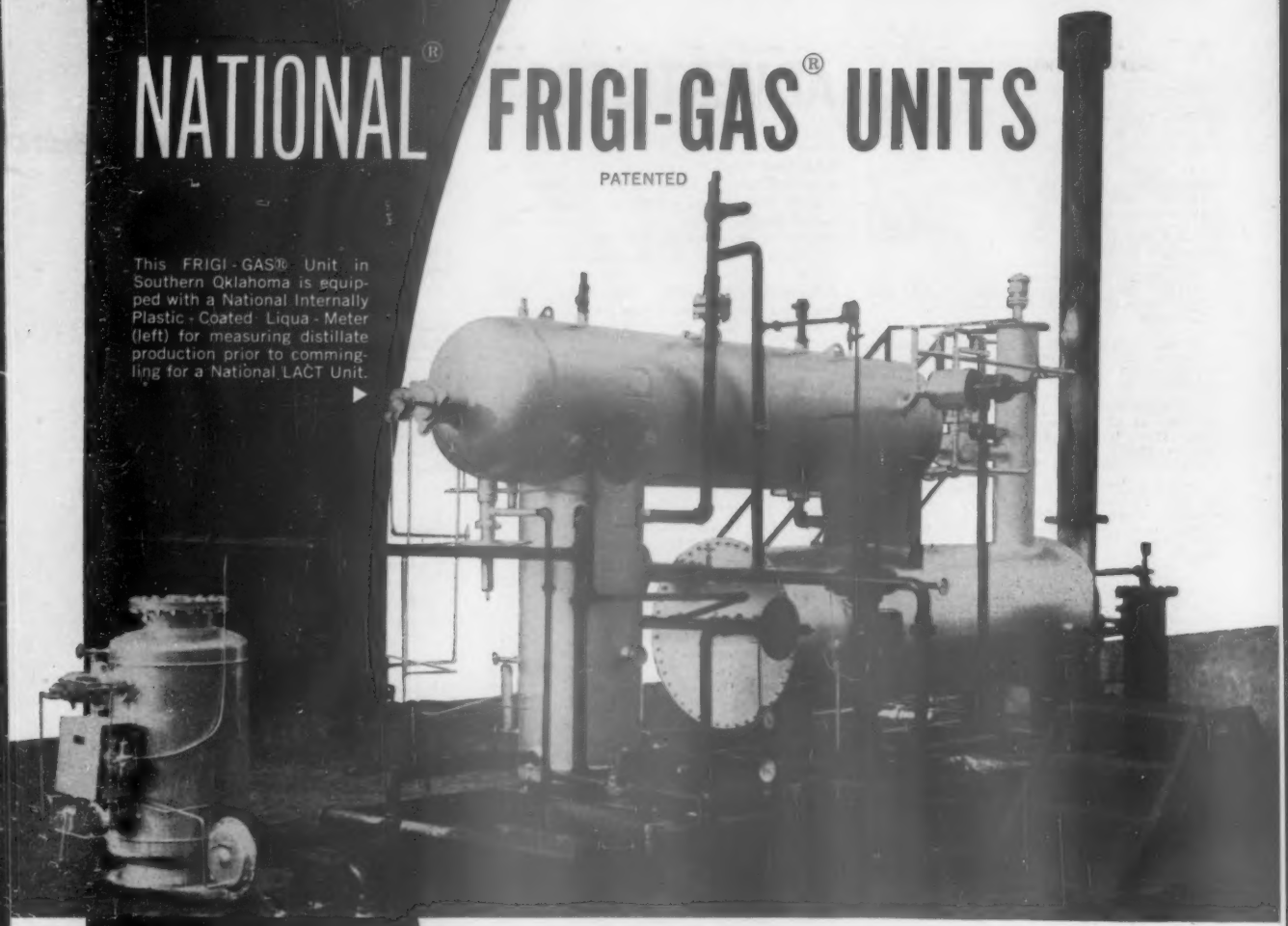

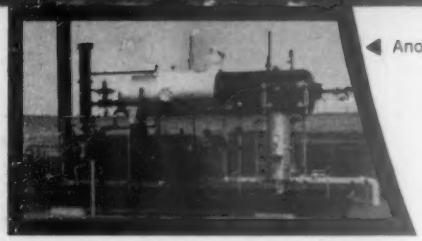

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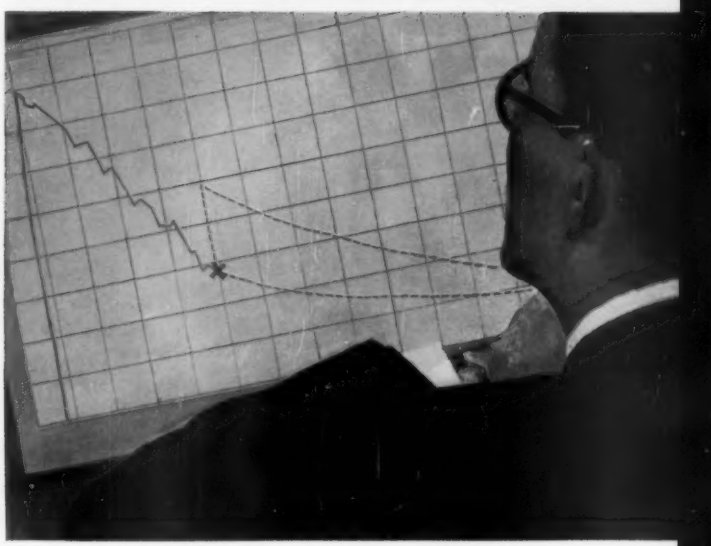

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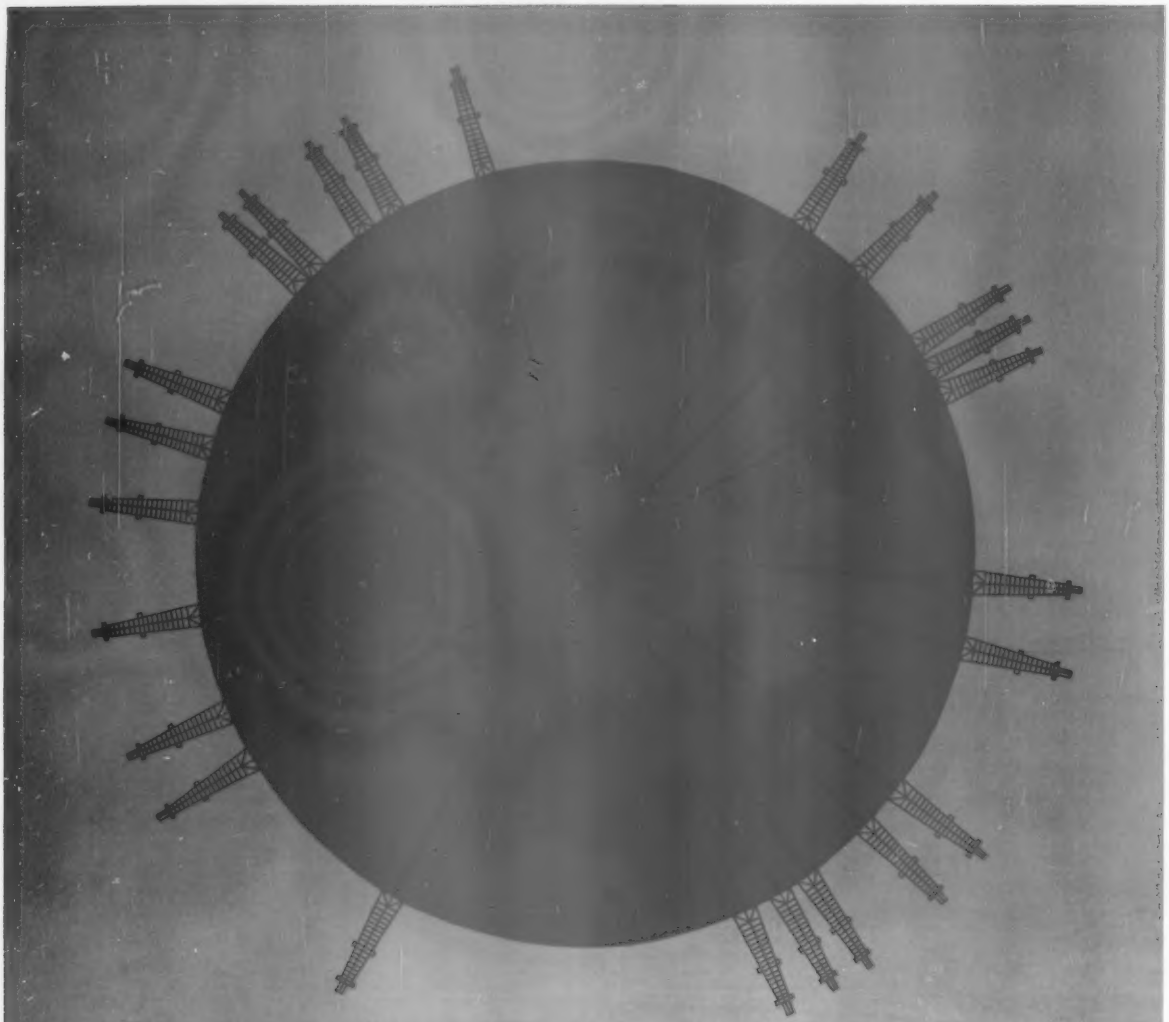

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